AUG 1 1 1924

Vol. 22. No. 8 AUGUST, 1924

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Entered as second class matter February 10, 1903, at the post office at New York under the Act of 1879.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES, TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN STREET, NEW YORK, U. S. A.

What *is* lacquer, anyway?

THE other day I was asked by the executive of a big metal products manufacturing concern:

"What *is* lacquer, anyway?"

He explained that, at the Annual Convention of American Electro-Plating Society, Hotel Pfister, Milwaukee, Wisc., many other executives asked this question in one form or another.

"It's as simple as A, B, C." I replied. "Lacquer is a coating for metal, wood and other material, applied to protect or to beautify—often for both purposes, of a rapid air-drying nature, requiring no heat or baking. Let's speak in terms of the average lacquer. First, there's a distinction between *transparent* lacquer (from water white to any imaginable color or shade) and lacquer enamel, in opaque colors, and all shades. Next comes the adhesive quality, *stick-to-it-iveness*, and the ability to stand the gaff, so necessary both in good men and good lacquers. Then there is *flexibility*—meeting any ordinary bending test without cracking the film. And, generally speaking, a lacquer must be heat-proof and water-proof."

Of course, there's a great difference between other lacquers and Zellac, and it's only a straight tip to add to this the fact that Zellac grades are *prescription-compounded, specially adapted to each and every user's individual needs!*" . . . Simple as A, B, C, yes!—but it's all in the "know-how."

Why not call on us with your lacquer problem?

Hugo Zeller
Pres.

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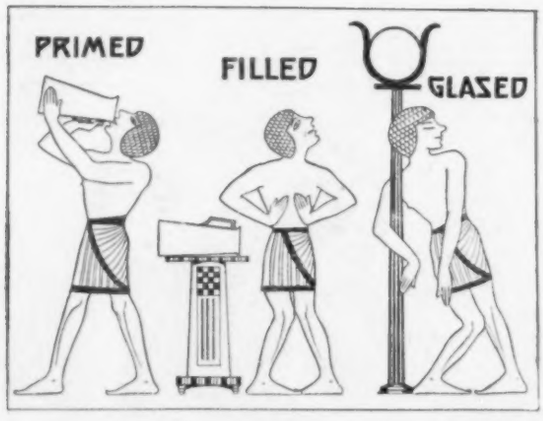
EGYPTIAN



FOUR thousand years ago, in the year 3994 B. V. D. (i. e., Before Volstead's Day) the processes of priming, filling and glazing were thoroughly understood by the Egyptians

* * * * *

TO-DAY, in spite of prohibition, Egyptian Primers, Fillers and Glazes are used extensively in all lines of metal and wood manufacture.

* * * * *

The Egyptian Lacquer Mfg. Co.

5 East 40th Street, New York

CHICAGO LOS ANGELES SAN FRANCISCO

LACQUERS

THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
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ELECTRO-PLATERS REVIEW

VOL. 22 NEW YORK, AUGUST, 1924 No. 8

The Manufacture of Copper Wire

A Description of the Operations from Wire Bar to Finished Wire

Written for The Metal Industry by WM. J. PETTIS, Rolling Mill Expert

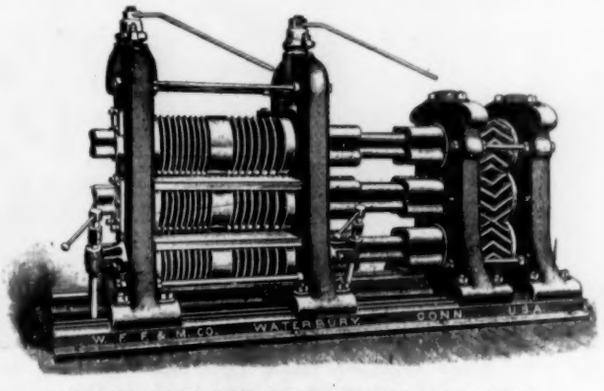
Brass has occupied such a prominent place in industry and the arts for over a hundred years that it has quite overshadowed its more modest parent, copper, which for centuries, in fact, as far back as records run, has been serving mankind in war and peace, and is still a most important agent in keeping the wheels going, though mostly out of sight. The public has been educated up to the general process of manufacturing brass, in its many forms, through interesting articles published in THE METAL INDUSTRY, but very little has been written concerning copper manufacture, and the process it undergoes before it is ready to be placed on the market.

The manufacturer of brass buys his copper and zinc in ingots from the refiners of these metals, remelts them to make the proper alloys for the quality of brass he desires and casts into bars or billets before he can roll them into sheet brass or strip. In contrast to this process the manufacturer of copper sheets, rods or wire will get his raw material from the refiner, in whatever form he requires, to start operations in the rolling mill as soon as received. For sheets or strips he obtains a flat copper cake, averaging from 200 to 500 pounds, the weight depending on the size of the sheets he wishes to produce. Should he wish to produce rods or wire he buys from one of the many refineries in the country what is known in the trade as wire bar. The copper comes to the manufacturer with a guarantee of at least 99.80 per cent purity, and that these bars shall be free from shrink holes, cold sets, pits, sloppy edges, concave tops and similar defects in castings. The wire bars are cast in a range of sizes, from about 3½ feet long, and 3⅝ x 3⅛ inches in cross-section (these bars weighing about 135 pounds) to a bar 4 feet 5 inches long and 4 by 3¾ inches, weighing 230 pounds. Special castings are made weighing as much as 700 pounds. These bars are wider at the top through the cross section than at the bottom and are so shaped in order to facilitate their removal from the mould. The bar is slightly pointed at each end.

FIG. 1. REFINED COPPER SHAPES

As copper lends itself perfectly to working while hot, this method is used in the initial reducing operation. In fact, where this will meet a commercial demand it is finished by this method. The wire bars are placed in a continuous heating furnace, designed with a view to prevent oxidation during the heat, as this scales the bar badly, and the hard scale is rolled into the metal, and will show up in the finished product, or is dislodged in subsequent operation, and leaves pits in the surface of the bar. This is a far more serious trouble in the manufacturing of copper sheets.

When the bars are at a proper heat they are taken from the furnace by the man in charge of the operation, the "heater," and delivered to the breaking down roll. This consists of a three-high mill, that is, three rolls mounted one above the other, in one stand. The top and bottom rolls turn in the same general direction, the middle roll turning in the opposite direction. This permits sticking the rod through from either side of the roll, and makes for rapid handling in rolling, a very important item in any operation that treats metal while hot, as it cools quickly



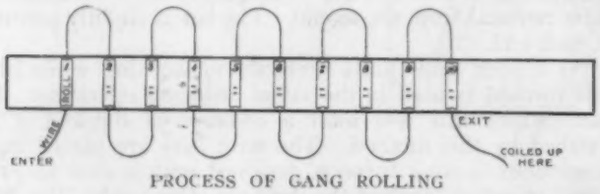
THREE HIGH ROD MILL, STATIONARY TYPE

and the object is to get the maximum reduction before it cools off. The rolls are grooved in a series of graduated sizes, each succeeding groove smaller than its neighbor, and so designed as to give the bar the maximum reduction possible, while avoiding rolling a fin on the bar, to prevent the metal spreading out beyond the groove, and between the flanges of the rolls. There are a great many systems of grooving a roll for quick reduction, but the general practice is first a square groove, then an elliptical groove, then a round groove; then repeat.

The wire bar is broken down on this mill to about ¾" round. The reduction from the 3½" square wire bar is a very speedy operation, and the bar is taken at ¾" round, still hot and put in a "gang roll," reduced to ⅜" round and wound up on a coiler as it leaves the last roll.

The operation of a gang roll is very interesting. The wire is being reduced by passing through several differently grooved rolls at the same time, at a high rate of speed, the arrangement of the rolls making this possible. These rolls carry only one groove in each pair of rolls, that is, top and bottom roll, and are set in a "frame," in a row, each succeeding roll being grooved smaller than its neighbor. There may be seven to ten rolls in a frame, each set of rolls turning in the opposite direction to the roll next to it, and the operation is taken care of by two men.

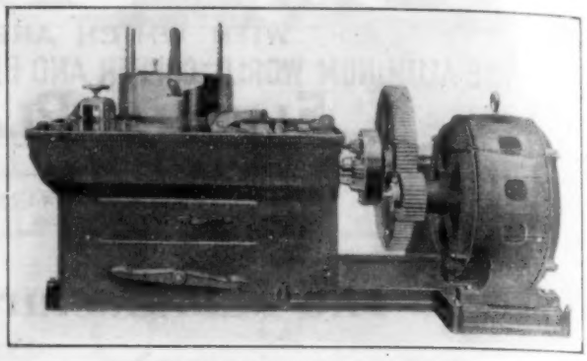
The following sketch will give an idea of this proceess: The reader is looking down on the mill; there is a man stationed on each side of the frame; the man on the



PROCESS OF GANG ROLLING

"enter" side gets the rod as it comes from the three-high mill, described above, and with a pair of tongs, thrusts the end in roll No. 1 which, let us say, is turning west. His mate on the other side of the frame grasps the wire with his tongs as it comes from Roll No. 1, loops it around and sticks it into Roll No. 2, which is traveling east, and this operation is continued until the wire is stuck into the final or finishing roll for this operation. As it leaves this roll it is wound up on a steel reel where it remains.

The whole process of reducing a copper bar weighing one hundred and thirty pounds, approximately 3½" square, from the time it is stuck into the three high breaking down rolls to its leaving the gang rolls, at about ⅜" diameter, and wound up on a reel, is a matter of minutes.



VERTICAL SPINDLE BULL BLOCK

From this operation the coils go to the wire mill. After being annealed and pickled, the copper oxide being removed by immersing in a sulphuric acid bath, the reducing operation is continued by a drawing process through steel dies. In some cases chilled iron dies are used, and on the fine wire diamond dies are used, on account of their extreme hardness. In some guages of wire it takes as much as twenty thousand feet to make one pound of wire, and the diameter must be exact to a fraction of a thousandth. No other material for dies will meet this demand; the making of the diamond dies is an art.

The machine used in the initial operation is called a Bull Block. It consists of a holder for the die, and a cast iron drum with jaws that grip the wire. The drum revolves and draws the wire through the die, the drum carrying a coil of wire several hundred feet long.

For the finest wire a special, continuous wire-drawing machine is used. Owing to its high ductility, copper wire will stand enormous reduction without re-annealing. The greater part of the copper wire manufactured is used for electrical purposes, such as trolley wire, cables, house wiring, etc., its high conductivity making it superior to any other metal for this purpose.

Metal for Friction Wedge

By JESSE L. JONES, Metallurgical Editor

Q.—Taking advantage of suggestion made in Kent's Mechanical Handbook for Engineers, 1923, I am taking the liberty to ask if you could recommend any kind of alloy more suitable than hard cast iron (disregarding the price), for the following purpose:

Friction wedge in a friction draft gear for railway car, working against .40% to .45% carbon open hearth steel, with a working pressure from 1,000 to 4,000 lbs. per square inch, occasionally rising as high as 10,000 lbs. per square inch, dry surfaces. The middle working pressure will be about 3,000 lbs. when the train is in motion, and reaching 10,000 lbs. per square inch in coupling up the train in the yard.

Also advise of the friction co-efficient is likely to rise higher than 0.4. Would C-5 or C-10 (Page 500), as given by Kent, be suitable?

A.—The alloy known as "C-5" and given on page 500 of Kent's Mechanical Handbook for Engineers, 1923, is a manganese bronze, and for this reason would not be very suitable for use as a friction wedge in a draft gear. Alloys of this kind have not been found satisfactory from an anti-frictional standpoint and they wear rapidly when in use.

The alloy known as "C-10" would be much preferable for the above use, although it is rather brittle.

A slightly different alloy is to be preferred to the C-10 alloy, namely, copper 124 pounds, tin, 33, zinc 1 lb. 4 ozs., lead 6 ozs. The copper should be melted in no more than 1 hour and 15 minutes and the other metals should be added outside the furnace. Heating the castings to 625° C. for two hours, then quenching in water at 50° C., preheating to 300° C. for 1 hour and then slowly cooling, is also recommended as giving a tougher product.

Another alloy that is worthy of trial for the purpose you mention, consists of copper 84, aluminum 10, iron 5, and 5 per cent aluminum vanadium 1.

The Mounting of Diamonds by the Casting Method

Correct Setting of Diamonds for Truing Abrasive Wheels*

By HOWARD MILLER

Head of Testing Laboratory, Fort Wayne Works of General Electric Company

The importance of correct setting of diamonds used for truing abrasive wheels cannot be over emphasized, for incorrect setting probably is responsible for more loss of stones than any other cause. A correct setting of any stone involves two major factors. First, the stone must be so placed that the best cutting point is available for use, included in which operation is a proper orientation of the stone to minimize shattering. Second, the stone with the exception of the small point exposed for use should be securely anchored.

Many schemes have been developed for mounting diamonds and it goes without saying that there are a number of successful methods in everyday use. However, all of them require expert knowledge gained after long experience. This is always true of the correct placing of the stone which constitutes the greatest problem in setting. The mechanical operation of anchoring the stone is also important; and it is the purpose of this article to describe an anchoring method which it is felt will be of interest to everyone using diamonds for the purpose under consideration.

It is evident that the most secure mounting is that in which the diamond is entirely surrounded by a relatively hard and tough material, impervious to the heat generated during the truing process. This of course requires pouring or tamping around the diamond a material having a sufficient degree of fluidity to conform to the contour of the stone, and has usually been done either by molten metal or mercury amalgams. The use of molten metal, especially the operation known as brazing where brass is used, subjects the diamond to a more or less high temperature with the possibility of doing harm to the stone unless great skill and care is used. The use of lower melting point alloys is therefore to be recommended.

In the method about to be described, the diamond is properly held by supporting wires and placed in the bottom of a split mold similar to a bullet mold. The stone and mold are then slowly heated to about 350 deg. F. The mold is then poured full of molten alloy which has previously been melted in the small electric furnace shown in Fig. 1. This alloy, familiar to the trade as Sampson Metal, is a mixture of

Zinc	90 per cent
Copper	5 per cent
Aluminum	5 per cent

It has a melting point of about 650 deg. F., and a Brinell hardness of about 78. Thus its relatively low melting point permits casting at temperatures that will not hurt the stone and at the same time the material is sufficiently strong and hard to hold the diamond properly.

FIG. 1. ELECTRIC ARC FURNACE SUPPLIED WITH ENERGY FROM THE STANDARD COMPENSARC IN THE FOREGROUND. THE COMBINATION IS HERE EMPLOYED FOR MELTING THE ALLOYS IN WHICH ABRASIVE DIAMONDS ARE MOUNTED

In developing a suitable alloy, a number of different varieties were made the subject of experiment, especially those of the aluminum series. This series was first suggested because aluminum has a somewhat lower melting point than brass. It was soon found that stones set in pure aluminum loosened and chattered after being used a short time; and on cutting open the nib, it was seen that air pockets had developed at the rear of the diamond, which resulted in its becoming loosened. This was mainly attributed to the diamond having floated slightly when the aluminum was poured into the nib. The diamond was then anchored securely in the bottom of the bullet mold by means of copper wire. Better results were obtained but still the diamond would loosen slightly, due apparently to the characteristic softness of pure aluminum. A copper-hardened aluminum was then tried and the results were much better. However, the melting and pouring characteristics of the aluminum alloys are somewhat critical, especially in such small castings as these. Efforts were then directed to the zinc series. The best results were obtained by the use of the zinc-copper-aluminum mentioned; and it is believed that the relative ease with which this alloy can be melted and poured together with a fair degree of hardness, recommends it for this class of work. Fig. 2 shows sections of diamond settings made with this alloy. It will be noted that the diamond is firmly embedded in the nib.

*From General Electric Review.

The furnace shown in Fig. 1 is built up of fire brick and refractory cement so constructed as to hold a small graphite crucible. Two carbons are inserted through the refractory wall, one from each side, and by means of a standard Compensarc an arc is drawn between the crucible and the electrodes which quickly melts the metal in the crucible. This type of furnace has been found very convenient for melting small quantities of alloys both in an experimental way and for limited production. It provides a clean, ready source of heat; and as the current is easily controlled, the heat can also be controlled so that once the metal is melted it can be kept molten at any temperature desired by controlling the current. The life of the crucible is very good and the expense of renewal is nominal. It has been found that about a five-eighth inch diameter white flame cored carbon for one electrode and an extremely hard carbon for the other gives the best operating results. The carbons are hand controlled, and to start the furnace it is only necessary to bring them in contact with the crucible and draw them away slightly. It is possible to melt a charge of the alloy in about 15 min., after which the current can be regulated to maintain the proper pouring temperature. The convenience of a melting furnace of this type can be appreciated in connection with work such as the setting of diamonds where its use is only intermittent. It always is ready for use, will melt a charge very quickly, and when the work has been done it is only necessary to pull a switch.

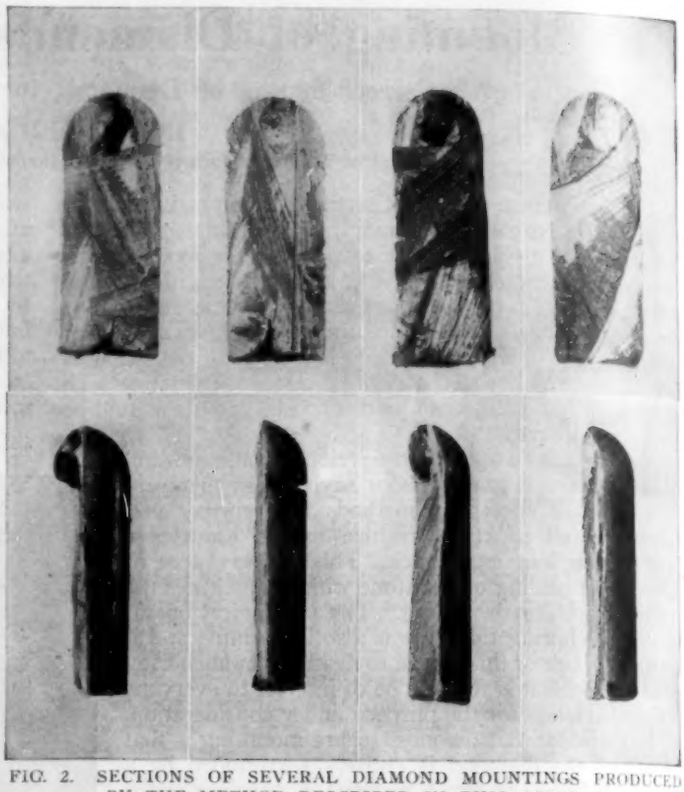


FIG. 2. SECTIONS OF SEVERAL DIAMOND MOUNTINGS PRODUCED BY THE METHOD DESCRIBED IN THIS ARTICLE

Testing Metals

The Resistance of Metals to Repeated Static and Impact Stresses. R. R. Moore.

Describes tests showing resistance of ferrous and non-ferrous metals to repeated reversals of both static and impact stresses. Evidence is given to show that it is possible to raise the endurance limit of some non-ferrous metals by gradually increasing the stress as the test progresses. The effect of surface finish of specimens is discussed.

Accelerated Fatigue Tests and Some Endurance Properties of Metals. D. J. McAdam, Jr.*

Describes a method by which the fatigue failure of metal specimens is greatly accelerated. The test is an actual breakdown test and the saving of time effected will be of great advantage. Results of endurance tests on steels and non-ferrous metals by the accelerated method and the slower methods are presented. Discusses the relation of the alternating torsion endurance range to its position within the elastic range of the metals.

*Abstracts of papers read at the Meeting of the American Society for Testing Materials in Atlantic City, N. J., June 24-27, 1924.

Tests on Nickel Anodes

Nickel anodes, such as are used for replenishing the solution in nickel plating, have formed the subject of a recent investigation at the Bureau of Standards. The purpose was to determine the relative behavior of different forms of nickel, such as electrolytic, rolled, and cast nickel, in the solutions used for electroplating. A study was also made of the effect of impurities, both accidental and purposely added.

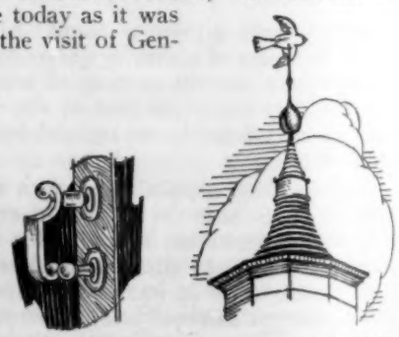
The experiments showed that the addition of a chloride to the solution caused all types of anodes to dissolve with a high efficiency. The chief difference in the behavior of the different types of anodes was in the uniformity with which they dissolved.

Anodes having a relatively high carbon content were found to dissolve more readily than do the more nearly pure forms of nickel, about 1.5 per cent of carbon being found satisfactory. Appreciable amounts of sulphur and copper were found to have a decidedly harmful effect on the anode.

Metal on Washington's House

Below is an illustration of a brass knocker on George Washington's house in Mount Vernon, Va. The knocker is just as handsome today as it was when it announced the visit of General Lafayette.

The copper weather-vane on top of the house is also as good today as it was when installed in 1743.—BULLETIN OF THE COPPER AND BRASS RESEARCH ASSOCIATION.



BRASS AND COPPER HOUSE FIXTURES

A List of Alloys

Reprinted from the Booklet Published by the American Society for Testing Materials. Part 9*

By WILLIAM CAMPBELL†

ALUMINUM ALLOYS

	ALUMINUM AL	COPPER CU	ZINC ZN	MANGANESE MN	MAGNESIUM MG	NICKEL NI	IRON FE	SILICON SI	OTHER ELEMENTS
Al-Cu, Strongest ..	Bal.	3.75	....	....	....	....	....	....	
Al-Cu	91.66	7.16	....	....	....	....	0.85	0.33	
Al-Cu	91.62	7.57	0.1	0.07	....	....	0.43	0.22	
Al-Cu-Ni	Bal.	2.	....	....	....	5.25	....	....	
Al-Cu-Ni	Bal.	4.1	....	....	....	1.1	....	....	
Al-Cu-Zn Strong:									
Cast	80.	5.	15.	....	....	....	....	....	
Forged	75.	3.	22.	....	....	....	....	....	
Centrifugal Cast.	80.	3.	17.	....	....	....	....	....	
Ingot	82.7	3.15	12.8	0.39	....	....	0.48	0.19	Pb, 0.19; Sn, 0.12
Ingot	82.8	5.52	9.9	0.18	....	....	0.81	....	Pb, 0.3; Sn, 0.27
Casting	83.55	4.87	11.1	0.06	....	....	0.19	0.27	
Al-Cu-Mg Casting.	93.6	3.61	....	....	2.23	....	0.31	0.28	
Al-Cu-Mg Casting.	93.	3.65	....	....	2.25	....	0.60	0.38	
Al-Cu-Mg Casting.	91.9	3.37	....	0.55	3.5	....	0.38	0.29	
Al-Cu-Mg Casting.	95.5	4.	....	....	0.5	....	....	....	
Al-Ni-Ti	97.6	....	....	....	....	2.0	....	....	Ti, 0.4
Al-Ni-Zn	85.	....	5.	....	....	10.	....	....	
Va Alloy	80.2	5.01	13.7	....	....	....	0.72	....	V, 0.2
W Alloy	82.1	12.32	4.5	....	....	....	....	....	W, 1.0
Alloys Research Committee:									
"Y" Casting	82.5	4.	....	....	1.5	2.	....	....	
"A" Forging	77.	3.	20.	....	....	....	....	....	
"E" Rolling	76.	2.5	20.	0.5	0.5	....	0.2	0.2	

TIN BASE ALLOYS

	TIN SU	ANTIMONY SB	COPPER CU	LEAD PB	OTHER ELEMENTS
Algiers Metal	94.5	0.5	5.	....	
Algiers Metal	90.	10.	....	....	
Algiers Metal	75.	25.	....	....	
Ashberry Metal	80.	14.	2.	....	Zn, 1.
Ashberry Metal	79.	15.	3.	....	Zn, 2.
Ashberry Metal, Brittania	77.8	19.4	2.8	....	
Ashberry Metal, Brittania	77.9	19.4	....	....	Zn, 2.8
Argentin	85.	14.5	0.5	....	
Aluminum Solder	85–50	....	....	....	Zn, 15-50
Burgess	76.	....	....	....	Zn, 21.; Al, 3.
Frismuth	67.	....	....	27.	Al, 3.
Grimm's	69.1	....	....	28.8	Zn, 1.44; Ag, 0.72
Grimm's	50.	....	....	25.	Zn, 25.
Aluminum, Wegner and Guhr's	80.	....	....	....	Zn, 20.
Aluminum, Wilmotts	86.	....	....	....	Bi, 14.
Aluminum, Various	Bal.	....	....	....	Zn, 8-15; Al, 5-12.
	50.	....	....	33.3	Zn, 66.6
	47.5	....	....	47.5	Ca, 5.
	49.5	3.43	1.1	26.06	Zn, 20.31
	85.	....	....	....	Al, 10.; P Sn, 5.
Babbitts, Original	89.	7.3	3.7	....	
Babbitts, Hard	83.3	8.3	8.4	....	
Bearing:					
Navy	89.	7.3	3.7	....	
Navy	91.	4.5	4.5	....	
Prussian	91.	6.	3.	....	
Prussian	90.	6.	4.	....	
Russian Railroad	90.	8.	2.	....	

*This booklet can be obtained from THE METAL INDUSTRY for $1. Parts 1, 2, 3, 4, 5, 6, 7 and 8 appeared in our issues of March, April, May, July, September, December, 1923; June and July, 1924.

†Professor of Metallurgy, School of Mines, Columbia University, New York.

	TIN SN	ANTIMONY SB	COPPER CU	LEAD PB	OTHER ELEMENTS
Automobile, American	89.	7.	4.	....	
Automobile, American	89.3	8.9	1.8	....	
Automobile, American	88.9	7.4	3.7	....	
Automobile, American	87.	7.	6.	....	
Heavy	85.	7.5	7.5	....	
French Car	83.3	11.1	5.5	....	
German Railroad	83.	11.	6.	....	
Valve Rods, etc.	82.	10.	8.	....	
French Railroad	82.	12.	6.	....	
Piston	81.	12.5	6.5	....	
Swiss Railroad	80.	10.	10.	....	
English	76.7	18.5	7.8	....	
German	76.	17.	7.	....	
Prussian	74.	15.	11.	10.6	Zn, 0.18; Fe, 0.22
Prussian	73.	18.	9.	....	
Prussian	72.	26.	2.	....	
(Kamarsch)	71.4	7.2	21.4	....	
Valve Packing	71.	24.	5.	....	
German	70.8	15.1	4.9	9.2	
(Kamarsch)	70.7	19.7	9.5	....	
G. W. R. England	67.	11.	22.	....	
French Railroad	67.	22.	11.	....	
English Railroad	90.	7.	3.	....	
German Ludenscheidt	71.8	24.3	3.85	....	
Brittania:					
English	94.	5.	1.	....	
English	90.	6.	2.	....	Bi, 2.
English	90.	7.	3.	....	
English	85.5	9.7	1.8	....	Zn, 3.
Cast	90.6	9.2	0.2	....	
Cast	85.5	10.5	1.	....	Zn, 3.0
Cast Tutania	91.4	....	0.7	7.62	Zn, 0.25
Cast Tutania	92.35	4.65	2.45	0.32	
Birmingham I	90.57	9.38	0.03	....	
Birmingham II	85.5	10.5	1.	....	Zn, 3.0
Sheet	91.5	7.1	1.4	....	
Sheet	90.6	7.8	1.5	....	
Spinning	93.7	3.75	2.6	....	
Spoons	88.4	8.7	2.9	....	
Spoons	88.5	14.4	0.15	....	
Spoons	84.7	5.0	3.7	....	Bi, 4.9; Zn, 1.
Spoons	88.42	8.68	2.8	....	
Spoons	85.42	14.42	0.15	....	
Spoons	84.46	5.62	3.68	....	Zn, 1.53; Bi, 4.88
Plate, Hard Spelter	90.62	7.81	1.46	....	
Plate, Birmingham	91.46	7.12	1.4	....	
Plate, Tutania	90.	....	2.7	6.0	Zn, 1.3
Plate, Deutsch (Ludenscheidt)	71.85	24.26	3.85	....	
German	84.	9.	2.	....	Zn, 5.
German	81.9	16.3	1.8	....	
German	70.82	15.10	4.91	9.21	
German, Various, Turn	93.65	3.75	2.63	....	
German, Queen's Metal	88.52	7.10	3.48	....	
Blatt-Silver	91.1	....	....	0.35	Zn, 8.25; Fe, 0.23
Bushing, Russian	72.2	....	1.3	....	Zn, 26.5
Clichier Metal	48.	10.5	....	32.5	Bi, 9.
Clichier Metal	80.	....	....	5.	Bi, 15.
Deurance Metal (Locomotive)	33.3	44.5	22.2	....	
Dudley Antifriction	98.13	....	1.6	0.25	
Fahrig Antifriction	90.	....	10.	....	
Gilding Foil	97.6	....	2.16	....	Fe, 0.11
Hard Head	90.	8.	2.	....	
Hammonia Metal	64.5	....	3.25	....	Zn, 32.25
Hoyles Metal	46.	12.	....	42.	
Husmann Metal	73.6	11.	4.	10.6	Zn, 0.18; Fe, 0.22
Jacoby Metal	85.	10.	5.	....	
Kamarsch Bearing	85.	5.	3.6	....	Bi, 1.6; Zn, 1.4
Minofor (Brittania)	68.5	18.2	3.3	....	Zn, 10.

This list will be continued in an early issue.—Ed.

Types of Molding Machines

Stripping Plate, Jar Ramming and Turn-Over Machines Described Through Representative Types

Written for the Metal Industry by R. E. SEARCH, Exchange Editor

STRIPPING PLATE MACHINES

With deep work having a small amount of taper, or spur wheels, pulleys and tooth wheels of small or medium size, the machine that lends itself to the use of the stripping plate method is the most useful. With this method the pattern may be drawn either up or down through the stripping plate, which holds the sand on the edge of the mold thus securing a perfect lift or draw.

In Figure 1 is an illustration of a combination jar-ram pattern drawing or stripping plate machine made by the Johnston and Jennings Company of Cleveland, Ohio. This machine may be used for making both cope and drag where it is found economical to put the drag on a stripping plate or pattern drawing machine, thus eliminating the use of a roll-over machine for the drag. These

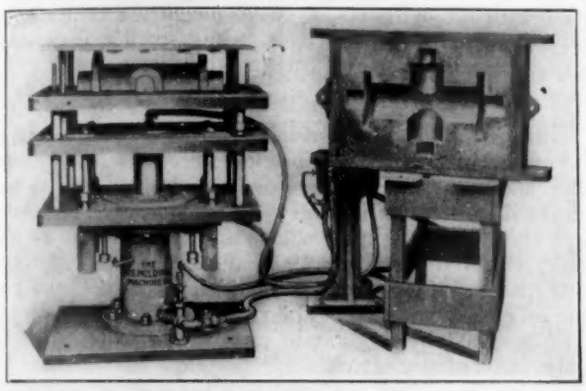


FIG. 1. A STRIPPING PLATE MOLDING MACHINE

machines have a positive jolt free from vibration or rebound and are equipped with cut-off valve which produces the desired results, and at the same time reduces the consumption of air to a minimum. It is claimed by the makers that these are the only stripping plate machines which have only one counterbalanced air-drawn cylinder possessing four heavy guides enclosed in long bushings, thus producing a steady and positive draw; the most complicated patterns can be drawn without any patching or handwork after the mold is made.

The draw pins are adjustable and work in slides on the drawplate, so that different size patterns can be used on the same machines, and the operator is not limited to only one size pattern, which is the case with most other machines on the market. The machines are so enclosed that all working parts are protected from dust and sand, thus all troubles of this kind are eliminated. The machines are fully equipped with vibrator, blow and draw regulating valve.

In a stripping plate machine, the stripping plate is fitted accurately to every outline at the joint surface of the patterns, obviously at considerable expense, and, of course, at the instant of drawing the patterns, supports the joint surface of the mold entirely. This is, at first sight, an ideal method of drawing patterns, and it has for years been the only method practiced on machines. It has two disadvantages: the patterns are separated from the stripping plate by the necessary joint fissures between the two. Fine sand continually falls into this fissure and adhering to the joint surfaces more or less, grinds the fissure wider. This leads to a gradual reduction of size of patterns on vertical surfaces and a widening of the joint fissure often to such an extent that wire edges are formed on the mold, causing on fine work "crushing" and consequently dirty joints. The stripping plate method has another drawback, not always appreciated, probably because accepted as inevitable. Stripping plate patterns are not rapped and frequently there occur on the surface of patterns, remote from the action of the stripping plate, rectangular corners just as important to mold sharply as those at the parting line. Such corners have to be filleted or stooled in stripping plate work, and neither method often is practicable. When the entire platen and plate are vibrated so that the corners where the pattern joins the plate draw perfectly, it is obvious that similar corners anywhere on pattern surface will draw equally well.

If a vibrator frame be attached to the plate carrying the patterns, the action of the vibrator is such as to give the entire pattern surface an exceedingly violent shiver, making it impossible for any sand to adhere to this surface, while the magnitude of the actual movement of the pattern is so slight that it is found to fill the mold so completely that it is impossible to draw it a second time without rapping. Yet so truly are the patterns held, and so little disturbed from their original position, that it is perfectly practicable to return patterns to a mold having the finest ornamental surfaces in the ordinary practice of "printing back."

The above method was advocated by the late E. H. Mumford, many years ago. About every stripping plate machine made in recent years is equipped with a vibrator attached either to the frame of the machine, where a match plate is used, or to the pattern plate, which is in action.

RAMMING

It is generally admitted that there are only three methods of ramming, namely: by hand, pressure and jolting, or it is often termed, jar-ramming. At first it does not appear that much saving of time could be effected on a hand-ramming machine. But when it is remembered that the patterns are drawn perfectly true, and therefore that the mold does not need tooling and patching, as is the case in the usual jobbing molding practice, it can be readily appreciated what a great economy is brought about by this means alone. The remark is often made that a hand-ramming machine is only half a machine; but four or five times the amount of work that a skilled molder will do can be turned out per day. The increase, therefore, must be due to the perfect drawing of the pattern, and the saving of time thus effected. Machines of this kind are greatly in demand with founders who have no power available or who are unable financially to bear the cost of a compressed air plant or hydraulic or electric power.

PATTERN DRAWING

As everybody knows, yet sometimes need to be reminded of the fact, and prodded in the ribs about it, there are practically only three ways of drawing a pattern in molding machine practice. (*First*:) the pattern is fixed and the mold is raised by means of posts attached to a frame, and operating under each corner of the flask part, i. e., on a non-turnover machine,—and in some instances lowered from the fixed patterns onto a table, which is raised to receive the flask—this would be on a turn-over machine. In both these ways the patterns are fixed and the mold is either raised or lowered according to the type

of machine. (Second:) the flask remains stationary and the pattern is raised or lowered. (Third:) the stripping plate method in which the patterns are drawn through, either upwards or downwards, the mold always remaining stationary.

JAR-RAMMING MACHINES

The combination jar-ramming and turn-over draw molding machine shown in Figure 2 was designed by the International Molding Machine Company of Chicago, Illinois, as a labor-saving device for which the machine is particularly suitable such as patterns for pistons and piston rings and work of like character. The machine consists of a main frame, a turn-over frame or pattern carrier and crank which is used to release the mold from the pattern after it has been rolled over and to support the mold in the proper position for lifting off.

The jar-ramming section of the machine consists of two heavy castings including the piston and table, which are cast together and the cylinder. The machine is of the valveless type and the operation of the piston is effected by port holes in the cylinder and a groove in the piston. A reservoir is provided for storing the air admitted during the downward stroke thereby effecting a large reduction of the air consumption. To eliminate the vibration of the entire machine while the mold is being rammed, the pattern plate, which rests on the table of the jar-ramming cylinder, is disconnected from the turn-over frame. This is accomplished by a locking and releasing mechanism which consists of a steel lever with rollers attached to the turn-over frame, a slotted pin which is attached to the jarring plate and an arm so located that when the turn-over frame is being lowered into the position shown in the illustration the roller on the sliding lever is engaged by the arm and drops down into the slot, causing the lever to slide forward and disengage it from the pin which previously held the plate and frame. Stops are provided slightly below the surface of the jar-ramming table for holding the turn-over frame when released from the jarring plate.

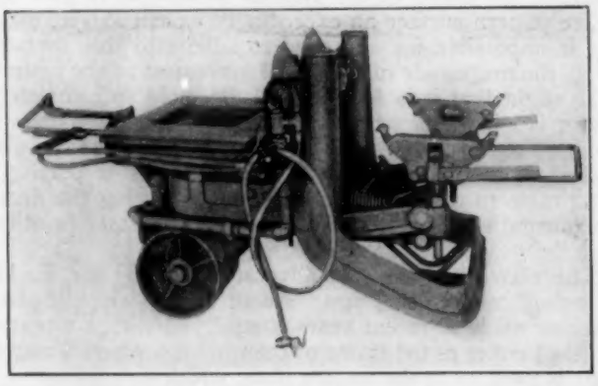


FIG. 2. COMBINATION JAR-RAM TURN-OVER DRAW MACHINE

The two telescoped columns, in which the parallel steel uprights travel while the foot lever is being lowered for releasing the mold, are provided with brass bushings extending their entire length. This provides a long bearing surface and in the machine illustrated it is 18 inches long. Attached at one end to the turn-over frame and at the opposite end to a stationary steel shaft at the rear of the machine, is a set of extension springs which counterbalance the weight of the mold while it is being turned over. These springs are equipped with eyebolts having right and left threads which permit of adjusting the tension in proportion to the weight of the mold. Another set of springs, attached at one end to the crank and at the other end to the cross rail of the steel frame, is provided to raise the mold automatically to a convenient height for the molder when lifting off. These springs also support the weight of the mold when it is lowered on to the receiving table and after it is lowered away from the pattern.

The two sets of stops which are provided to limit the movement of the pattern frame when it is turned over are machined so as to locate the plane of the pattern at the proper angle to effect a perfect draw. To the steel shaft on which the turn-over frame revolves there is attached an adjustable flask rod for clamping the bottom board and mold to the turn-over frame. The flask receiving devices have points of contact which are depressed to compensate for irregularities in the surfaces of bottom boards and these points of contact are locked by levers when the flask is in position. The height of these receiving devices is adjustable to flasks of different depths. All working parts are well protected from sand and the center columns which engage the steel uprights have been raised above the floor level. The mold is turned over and the pattern is released by hand. However, when the work to be molded is too large to be handled in this way, this machine is provided with air cylinders, a large one in the center being utilized to turn the mold over, while small cylinders are located on either side for drawing the pattern.

A TURN-OVER FRENCH MOLDING MACHINE

In an article that is describing so many different types of American molding machines it is necessary to say something about their strongest foreign competitor who has disagreed with them in every conceivable direction, both as to the principles upon which they operate and on the results achieved ever since 1907, and even to this day contends that hydraulic power is the power par excellence and none other should abide. The turn-over machine referred to is designed by Bonvillain and Ronceray, of No. 32 Boulevard Voltaire, Paris.

This machine does not require a pit in front to permit of rotating the machine. The machine does not rise above the ground level, and as a result its use is rendered more handy, but its capacity is slightly less, its ramming stroke and pattern drawing arrangement are only 12 inches instead of 16 inches, which corresponds to the dimensions of fairly large molds.

Instead of being provided with a swinging head, the table rotates around the column and is thus brought to the side of the machine, giving an arrangement, which is advantageous, when it can be used, so that the table is in position close to the sand heap. On the other hand it is not easy to have a pattern drawing arrangement with such a long stroke.

The rolling over of the machine is obtained by means of a cylinder, and one single piston worked by a lever, which is clearly shown at the side of the machine. A handwheel situated above the pressure head is used for regulating the stroke of the ramming plunger.

One lever only works all the movements. By pushing to the right, ramming is effected, while a motion to the left withdraws the pattern. In the middle position the two movements are neutralized. The pattern drawing can also be effected by a pedal fixed to the lever.

M. Ronceray's ideas about molding machines are summed up in the following conclusions:

A.—For all molds, small or medium, relatively shallow, squeezing is to be selected.

B.—For all molds, small or large, low or deep, where the pattern drawing is most important and for those where projections and numerous loose pieces are used the pressure ramming is to be selected even when it involves ramming by two or more squeezings.

C.—For large flat molds jar ramming presents great difficulties. Jarring machines are, however, to be recommended where there is a special difficulty of ramming for which it is specially convenient (large number of narrow pockets of sand) in spite of the various difficulties mentioned.

D.—For large molds, of deep and simple castings in which the pattern drawing does not necessitate any great degree of precision, or where there are few molds to make, jar ramming is to be recommended. The finishing is mostly done by hand.

E.—Water pressure is desirable in all cases for pressure machines; nothing else permits of pressure ramming large molds.

This means that where hydraulic pressure is used, the pressure machine exhibits superiority. The combination of the two methods of ramming can give good results, and it is at all times desirable that the pressure maintains the chief feature, which is rarely the case in existing machines.

M. Ronceray's paper on the Comparison of Molding Practices, American and Foreign, may be found reported in full in the Paper which was read at the Rochester Convention and published in the Transactions of the American Foundrymen's Association for 1923.

Casting Metals

A Variety of Melting and Molding Troubles and Their Solutions*

Written for The Metal Industry by WILLIAM J. REARDON, Foundry Editor

MANGANESE BRONZE

Q.—I have a quantity of cheap yellow brass castings to make that must pull 50,000 lbs. T. S. I would like to know if it is possible to use clean yellow brass bar ends with the addition of ferro-manganese to get this pull. If so kindly give me some idea as to what proportion of this ferro-manganese I could add to bring this metal up to the test. They could pull a little more or less, that would not matter so much. I do not care to use manganese bronze ingots.

Would you also give me your idea of the best way to gate and pour a test bar of this metal, using a pattern, 1 in. square by 6 in. long?

A.—It will be necessary, if you want to make a mixture of yellow brass to pull 50,000 lbs. T. S. to know what you have in your yellow brass scrap. We would suggest that you take a good sample of the scrap you are using and have it analyzed. If it is turnings, mix them well by turning over as you would a sandpile in the foundry,

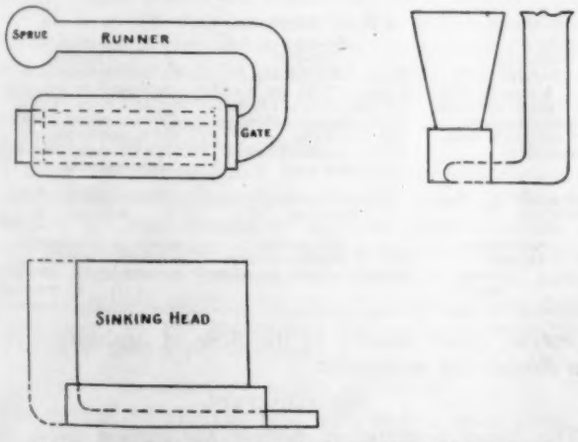


FIG. 18. GATING MANGANESE BRONZE TEST BARS

quarter it down, select your sample and run down into a small ingot and analyze. To get such a strength it will be necessary to have, 58½ per cent. copper, 41 per cent. Zinc, ½ per cent. Aluminum. It will be necessary to live up very close to this mixture, which can be done very readily from yellow brass. It is no trouble to get 50,000 lbs. T. S.

If you wish to use manganese as a hardener this can be done, making a hardener of: 63 per cent. Copper, 25 per cent. Ferro Manganese, 10 per cent. Aluminum, 2 per cent. Iron, and pour in ingots, and build up your yellow brass scrap to contain 54 per cent. Copper, 40 per cent. Zinc and add 6 per cent. of the hardener. Take sample from your pot by dipping out a small amount from the crucible and pour in a small bar and test with a sledge. If the metal is brittle add more copper. However, if you stick to the mixture given you will have very little trouble getting the results you desire.

Would suggest to pour and gate test bar like enclosed sketch.

FURNACE LAYOUT

Q.—We are enclosing herewith rough sketch of our furnace lay-out. We do not seem to be able to get sufficient number of heats out, as now erected. We think that our trouble lies in the main flue being only 12" square and

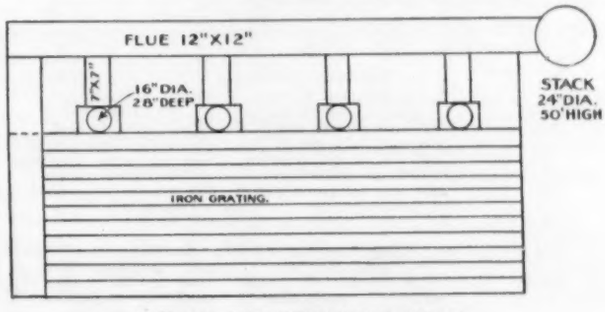


FIG. 19. PIT FURNACE LAYOUT

that it should be considerably larger but are writing you for your opinion. About the best that we can do at present is four pots out of each furnace. We would like very much to increase this to six, if possible

A.—In checking up the sketch we find the flues from the furnace to the main flue too large, and the main flue too small. The stack is O. K.

Common practice in figuring natural draft furnaces is that the flue from the furnace to the main flue should be 40% of the area of the diameter of the furnace, taking the largest diameter of the crucibles for the inside diameter.

The main flue should be 20% greater area than the total area of all the furnace flues connected to it, and the stack should be 20% greater area than the main flue.

If you will change your furnace flues to 7" x 6" and the main flue to 12" x 18" your furnace should work well, providing your stack is higher than surrounding buildings.

*Previous problems in this series have been published in our issues of January, February, March, April, May, June and July, 1924.

The Determination of Carbon in Aluminum

Comparison of Various Methods for Estimating the Carbon Content of Aluminum Shows That the Best Method Entails the Combustion of the Metal with An Oxidizing Reagent, by R. Hahn*

Translated for The Metal Industry by ROBERT J. ANDERSON and SAMUEL H. BROOKS, Metallurgists

Few data as to the carbon content of aluminum and aluminum alloys are available in the literature. According to Gmelin-Kraut[1] and Lunge-Berl[2], aluminum may contain up to 0.1 per cent carbon. Recent investigation by Czochralski[3], which has been confirmed by Wetzel[4], has shown that the average carbon content of ordinary commercial grade of aluminum is 0.03 per cent. This figure may be taken as the actual content usually found. Greater amounts of carbon occur in aluminum only under special melting conditions, e.g., when aluminum is very much overheated in the presence of carbonaceous matter it may at times take up as much as 0.2 per cent carbon. Differences in the published data as to the carbon content of the metal may very well be traced to the unreliability of the methods used for analysis. It may be of general interest, therefore, to study the peculiarities in the various analytical methods.

The methods which appear for consideration may be divided into three main classes; viz.:

1. Wet methods of oxidation, using chromic-sulphuric acid in a Corleis flask.
2. Dry methods of oxidation, using a combustion tube, and with or without oxidizing reagents.
3. The method of Moissan (i.e., a combination wet and dry method).

The details for carrying out these methods will be given below, as they are generally understood.

Table 1 gives the qualitative values obtained for aluminum and iron by different investigators, using the chromic-sulphuric acid method. Table 2 gives quantitative values obtained by the second method, i.e., dry combustion with an oxidizing reagent (method of the writer) as well as values by the third method.

TABLE 2.

Carbon content of aluminum and aluminum alloys

Experiment number	Material	Condition,	Material of crucible,	Per cent, mean of two values, Method of Moissan,	Combustion with CuO,
1			.....	....	0.025
2	Pure aluminum from different sources	As received	.....	....	0.021
3			.....	....	0.013
4			.....	....	0.03
5			.....	....	0.02
6			.....	....	0.01
7			.....	0.029	0.035
8	Aluminum + carbonaceous matter	Melted under charcoal at 1,100°C.	Alumina	....	0.18
9					
10		As received,	.....	0.029	0.038
11	Aluminum-silicon alloy	remelted	Graphite	0.032	0.038
12		Same	Grog	0.044	0.058
13		Same	Same	0.030	0.038
14		Same	Graphite	0.042	0.050
15		As received, remelted	..... Graphite	not tested Same	0.048 0.051

According to the modified method given by Wetzel[5], in which a great excess of chromic acid is added to oxidize the nascent hydrogen, the tendency to form an explosive mixture is considerably decreased; however, the reaction still proceeds rather violently at 100° C. so that, even with this method, gradual oxidation is not had. Other than this objection, great velocity in the flow of unabsorbed carbon dioxide can be avoided.

TABLE 1

Solubility indications of iron and aluminum in chromic-sulphuric acid at different temperatures

Material (drillings)	Solution 1, (Bauer and Deiss) 35 c.c. chromic acid, (1 c.c. = 0.75 gm. Cr_2O_3) 150 c.c. copper sulphate, (20% concentration) 200 c.c. sulphuric acid, (concentrated)	Solution 2. (Classen) 25 c.c. chromic acid, (1 c.c. = 1 gm. Cr_2O_3) 150 c.c. copper sulphate, (20% concentration) 200 c.c. sulphuric acid, (concentrated)	Solution 3. (Warmbrunn) 50 c.c. chromic acid, (1 c.c. = 1 gm. Cr_2O_3) 150 c.c. copper sulphate, (10% concentration) 200 c.c. sulphuric acid, (concentrated)	Solution 4. (Mette) 20 c.c. chromic acid, (1 c.c. = 1.08 gm. Cr_2O_3) 150 c.c. copper sulphate, (10% concentration) 150 c.c. water 50 c.c. sulphuric acid, (concentrated)	Solution 5. (Wetzel) 60 c.c. chromic acid, (saturated in the cold, 1 c.c. = 1.8 gm. Cr_2O_3) 150 c.c. copper sulphate, (20% concentration) 150 c.c. sulphuric acid, (concentrated)
	Temperature of the solution, °C	Temperature of the solution, °C	Temperature of the solution, °C	Temperature of the solution, °C	Temperature of the solution, °C
	20 50 >100	20 50 >100	20 50 >100	20 50 >100	20 50 >100
Iron.....	small bubbles moderately soluble	small bubbles moderately soluble	small bubbles moderately soluble	not tested	small bubbles moderately soluble
Pure aluminum	no attack strong reaction	no attack strong reaction	no attack strong reaction	no attack slight attack strong reaction	no attack strong reaction

WET OXIDATION

The ordinary method for the determination of carbon in iron may be applied in modified form to the estimation of carbon in aluminum. As shown in Table 1, in the case of the wet oxidation method, reaction with iron starts at room temperature and is more rapid at higher temperatures for different solutions so that the oxidation rate can be readily controlled. When aluminum is placed in the same solvents (cf. Table 1), attack is slight under 80° C.,

DRY OXIDATION

The direct combustion method for carbon, as in the method employed for iron where oxygen is used at high temperature, gives low values as experiments by Wetzel have shown. This may be traced to the circumstance that the aluminum particles coalesce in drops and become covered with a thick oxide film at the high reaction temperature, the metal consequently being protected from further oxidation. True values are obtained if the combustion of aluminum is carried out under oxidizing reagents, e.g., powdered copper oxide, as in the method given by Kuder-

*From the German, "Die Bestimmung des Kohlenstoffs im Aluminium," Zeit. für Metallkunde, vol. 16, 1924, pp. 59-60.

[1] Handbuch der Anorganischen Chemie, p. 571.

[2] Chem.-techn. Untersuchungs-Methoden, vol. 2, p. 791.

[3] Zeit. für Metallkunde, vol. 13, 1921, p. 589; *idem.*, vol. 14, 1922, p. 282, and vol. 15, 1923, p. 275.

[4] Metallbörse, vol. 13, 1923, p. 936.

[5] Metallbörse, vol. 15, 1923, p. 936.

natsch for iron. In this method, fine particles of aluminum are mixed with copper oxide, charged into porcelain boats, and burned in a combustion furnace in a stream of oxygen. As shown in Table 2, the carbon content of pure aluminum obtained from different sources was 0.01-0.035, while in aluminum-silicon alloys as much as 0.058 per cent carbon was found. The determination of carbon by this method can be easily carried out in the space of one or two hours.

COMBINED METHODS OF MOISSAN

The carbon content of aluminum is determined according to the method of Moissan by burning in oxygen the carbon-containing residue left on an asbestos filter after filtering the solution obtained from the attack of potassium hydroxide on the metal; the carbon dioxide formed on combustion is measured.

As shown in Experiments Nos. 7-13 of Table 2, the values obtained by this method are about one-third lower than those obtained by the copper-oxide method above described. This is obviously due to the fact that on dissolving the aluminum in potassium hydroxide part of the carbon is evolved in the form of hydrocarbons.

SUMMARY

The wet oxidation method in a Corleis flask using chromic-sulphuric acid requires much time and the reaction is so violent that the apparatus may be destroyed. Moreover, it gives only approximate values. The method of Moissan is evidently not useful since the values given are too low. The dry combustion method under an oxidizing reagent (copper oxide powder), as suggested by the writer, gives reliable values and can be carried out in fairly short time.

The Brass Solution

How to Keep a Brass Solution Under Control, by Analysis*

By O. J. SIZELOVE, Newark, N. J.

To the majority of platers the brass solution is the most troublesome of all the different solutions, simply because it is the least understood. Why? Because the platers do not study the conditions that enter into the proper control of the solution.

When we stop to consider that we have two different metals to be deposited in a different ratio, it is readily seen that the solution must be kept at a standard, although a greater proportion of one metal must be deposited than the other.

How much easier it would be if he knew the amount of copper, zinc and cyanide the solution contained and from practical experience, be able to add just the right salt and the correct amount.

The metal content of the bath is regulated by the requirement of the color desired. A good yellow brass is deposited from a solution containing 80% copper, 20% zinc. If a green cast is wanted for the deposit then 65% copper 35% zinc should be the proportions of metal used. Each color can be produced from a solution containing the salts of the metals and cyanide without any of the so-called addition agents providing the temperature and current conditions are right.

The amount of metal and free cyanide depend to a certain extent upon the class of work being done. Still solutions that are used for heavy deposits should contain at least 3 oz. of metal per gallon with a free cyanide content equal to the metal content. If the solution is being worked for a light green color then it is best to keep metal content at 1½ oz. per gallon and with a free cyanide content equal to the copper content.

ANALYSIS OF BRASS SOLUTION

The method of analysis that follows has been given a rigid test, is accurate and at the same time the most simple that could be devised. Complete analysis of the solution can be made in an hour's time after one has become familiar with the method.

The cyanide content is determined by using a standard solution of Cu $(NO_3)_2$ instead of the Ag NO_3 method which is inaccurate and misleading if addition agents such as NH_4Cl, NaOH or NH_4OH are used in the bath. The advantage in using the Cu $(NO_3)_2$ solutions is that the end point is decidedly more accurate and the above-mentioned addition agents do not interfere.

Take 10 c. c. of the brass solution, dilute to 100 c. c., add 5 c. c. NH_4OH and titrate with Cu $(NO_3)_2$ solution until a faint blue color persists after stirring for a moment.

The Cu $(NO_3)_2$ solution is made by dissolving 24.16 gms. C. P. Cu $(NO_3)_2$ in H_2O and diluting to exactly 1 Liter. It is standardized against a weighed quantity of NaCN and factor obtained.

Calculations. Number of c. c. Cu $(NO_3)_2$ used X factor X13.3=oz. per gallon free cyanide.

The metal content has been greatly simplified by the method of separating the zinc from the copper.

10 c. c. of the solution are taken. Place in 250 c. c. beaker, Add 100 c. c. H_2O heat and add a saturated solution of C. P. Na_2S with constant stirring which completely precipitates the Zn. Digest filter and wash. Save filtrate for Cu determination.

The ZnS with filter paper is placed in 250 c. c. beaker. 10 c. c. C. P. HCl are added. Boil to expel H_2S and add a few crystals Na_2SO_3. Dilute to 150 c. c. Heat to 140° F and titrate with K_4FeCN_6 using Ur $(NO_3)_2$ as an outside indicator.

The standard K_4FeCN_6 is made dissolving 21.63 gms. K_4FeCN_6, 7 gms. Na_2SO_3 in H_2O and making to 1 Liter. It is standardized against .3 gm. pure zinc for factor for K_4FeCN_6.

Calculations. Number c. c. K_4FeCN_6 used X factor X13.3=oz. per gallon metallic zinc.

For the copper content, take the filtrate from which the Zn. has been precipitated and make decidedly acid with HCl. Avoid great excess. Digest and filter. Decantation may be used here as the precipitate settles rapidly. Dissolve the Cu_2S in 5 c. c. HNO_3, boil to expel NO_2. Neutralize with NH_4OH, boil and add 10 c. c. $C_2H_3O_2$. Dilute to 150 c. c., cool, add 3 gms. K. I. and titrate with $Na_2S_2O_3$ using starch as an indicator.

Standard $Na_2S_2O_3$ is made by dissolving 24.822 gms. $Na_2S_2O_3$ and making to 1 Liter. Standardize against .2 gm. pure copper wire for factor $Na_2S_2O_3$.

Calculations. Number c. c. $Na_2S_2O_3$ used X factor X 13.3=oz. per gallon metallic copper.

In conclusion, I will say that the sooner the plater realizes that the proper way to maintain his solutions is by chemical analysis, the sooner will the majority of his troubles disappear and the more efficient man he becomes.

*From the Monthly Review.

Mechanically Perfect Electrolytic Nickel

Methods of Making Ductile Electrolytic Nickel[1]

By CHARLES P. MADSEN, Consulting Engineer

In a former paper[2] I disclosed a new method of making a highly ductile nickel, but intimated that better results were obtained on large scale operations by the use of an addition agent and a new anode, neither of which I was then at liberty to disclose. The addition agent referred to is hydrogen peroxide, and the anode may be briefly described as to consist of the eutectic of tri-nickel carbide and pure nickel.

I. COMMON DEFECTS OF ELECTROLYTIC NICKEL

The common defects of ordinary electrolytic nickel are:

1. Lack of ductility.
2. Presence of "carbuncles."
3. Failure after annealing.
4. Presence of pits.

The last two are related, and are by far the most difficult to overcome.

Ductility. Lack of ductility is caused principally by soluble organic compounds in the bath, although hydrogen and iron are also factors under certain conditions. All commercial nickel salts contain organic matter; furthermore, open tanks will be exposed to the organic dust of the atmosphere; finally, greasy or oily cathodes, not properly cleaned, will introduce organic compounds into the solution. Less than one part in a million of soluble organic material will affect the degree of ductility of the deposited nickel; even 10 mg. per L. of some organic substances will make the metal very brittle. Practically all of the organic matter can be completely removed or destroyed by chlorination; small amounts may be eliminated by hydrogen peroxide.

The relative quantity of hydrogen generated is a function of the electrolyte temperature with relation to current density and acidity; and the amount absorbed by the cathode is a function of the temperature with relation to the amount of iron that is co-deposited with the nickel and the amount of soluble organic material in the bath. The co-deposition of hydrogen diminishes so rapidly with rise of temperature that at about 60° C. electrolytic nickel having a ductility at least equal to that of copper can be produced from an electrolyte which is **free from organic matter,** but whose composition, temperature, electrodes, etc., may otherwise vary within wide limits. On the other hand, such nickel may, however, be so afflicted with any or all three of the other defects that its only commercial use would be for making nickel alloys by melting.

"Carbuncles." "Carbuncles" are caused by floating or suspended insoluble particles somewhat above colloidal size, and their formation is aggravated by too high a current density. Cutting down the current helps only temporarily, because particles falling into the vat from the air and accumulating from decomposition of commercial anodes will soon reach a concentration at which "carbuncles" will form even at low current densities. The apparently obvious remedy of continuous filtration is not so easy to apply as would appear. Impure commercial nickel salts and commercial nickel anodes require the presence of nickelous hydrate in the bath. Any filtration employed to prevent "carbuncles" will also remove this hydrate, resulting in cathode metal which is highly pitted, and which will fail after heat treatment. Bags or diapharagm cells are only partially effective, because soluble ferrous salts will readily hydrolize and oxidize after passing through the diaphragm. The practical remedies are to be sought in the use of very pure anodes, and by either keeping the bath covered or by working in a dust proof room.

Failure after Annealing. Nearly all electrolytic nickel now made, even that which is partly ductile, will become "cold short" after heating above a red heat, whether it has been mechanically worked or not. For instance, it may initially have a Brinell hardness of only 90 to 100, and a ductility equal to that of copper, but if heated to above a red heat its ductility will drop to below that of cast iron without change in hardness. The best of such nickel metal may be mechanically worked to an extent far greater than that of any other common metal without embrittlement, although its Brinell hardness may increase to 183; but if it be heated above a red heat, both tis ductility and tensile strength will drop far below the original, even though its hardness may be reduced to the original figure. Such metal has limited industrial applications and its use may be seriously objected to, in some cases.

The cause of this "cold short" phenomenon is the deposition of true colloids on intercrystal facings, which probably enlarge upon heating, thereby rupturing the crystal bondage. These colloids are, in the order of their importance, ferric hydrate, organic colloids, colloidal graphite and insoluble lead salt colloids. The obvious remedy is to avoid the formation of any trace of these colloids in the bath, but this is commercially impractical at present. Neither ordinary filtration nor the supercentrifuge will remove all of them. They can, however, be agglomerated or depeptized and then removed by ordinary filtration.

Pitting. This defect has been by far the most difficult to overcome of all defects of electro-nickel. Pits are produced by the catalytic action of a fine foreign particle at one or more points on the face of the cathode, causing the formation of, and discharge of, atomic hydrogen at that point or points. The metal deposits around the hydrogen stream, forming a deep well with a concave mirrored bottom. There are apparently at least two principal classes of these fine particles—living organisms and ferric compounds. Our tests indicate that there are several ferric compounds which can act in the above way, but their exact nature is not known.

Soluble ferric salts can cause this pitting trouble, but their is evidence that other less soluble ferric compounds will form from these salts, which will increase the pitting. One of these componds is probably a hydrated ferric oxide, but the worst one seems to be an oxychloride. It has been impossible to determine their exact nature, since not enough material has been available; it takes less than one part in a million of the bath to cause pits.

It has been equally impractical to prevent the generation of sufficient hydrogen to produce at least one pit if one catalyst particle be present, and to prevent the formation of at least one catalyst particle on the cathode by any amount of practicable filtration; and a single pit is sufficient to ruin an otherwise perfect cathode.

Addition of Hydrogen Peroxide Eliminates Pits. The presence of small amounts of hydrogen peroxide into

[1] A paper presented at the Forty-fifth General meeting of the American Electrochemical Society, held in Philadelphia, Pa., April 24, 25 and 26, 1924.

[2] Trans. Am. Electrochem. Soc., 39, 483 (1921).

the bath has been found to prevent pits and most ills of electrolytic nickel.

This effect was discovered through the discrepancies in obtaining electro-metric pH readings, which have also been reported upon by Blum.[3] It was noted that such readings made on a new bath of known acid content checked fairly well with one another, but that such a bath always produced many pits on the cathodes. After long continuous operation of the bath, pH readings no longer checked among themselves but the number of pits produced diminished, in spite of the evident increase in impurities in the bath, which were known to enter into the pit-forming mechanism. The pH valves were checked by the iodate method, and by the known pH values at which ferrous and nickelous hydrate respectively balance. Boiling the test sample raised the pH reading materially.

This indicated that something was formed by electrolysis which discharged the hydrogen electrode, but diminished pitting. Our analyst reported finding faint traces of persulfates or hydrogen peroxide in sulfate electrolytes after electrolysis. When a few drops of 3 per cent H_2O_2 were purposely added per liter of a new bath, the same high grade metal was produced, and the same pH reading obtained, as that obtained from a long used nickel plating bath. Larger amounts of H_2O_2 were found absolutely to prevent the formation of any pits, regardless of the amount of impurities present in the bath. These impurities may, nevertheless, cause any of the other nickel diseases or defects. The presence of the peroxide brings about other valuable results, the reasons for which are not all yet known. One valuable result is that the size of ferric hydrate colloids seems to enlarge, so that these can be filtered out and thus remove one of the causes of failure after annealing.

Many other known oxidizing agents were tried, but none was found to be as beneficial as H_2O_2, and nearly all of them directly or indirectly caused other troubles.

II. PRODUCTION OF PERFECT ELECTROLYTIC NICKEL METAL

Iron Mechanism. From the results outlined above, we are led to conclude that iron plays an important part in the causes of all the electrolytic nickel diseases, and that the quality of the cathodic product obtained depends upon the chemical and physical condition of the iron compound present in the bath. We may summarize as follows: Ferrous hydrate is highly beneficial, tending to produce smooth cathode metal and to diminish pitting, but it can not be maintained in this ferrous condition for any length of time. Ferric hydrate, in colloidal form, causes failure after annealing, and in agglomerated form in the bath causes "carbuncles." Soluble ferrous salts obviously permit the deposition of metallic iron, forming a ferro-nickel alloy, which absorbs more hydrogen than the pure nickel, and is therefore harder and much less ductile. Soluble ferric salts enter into the mechanism of pit formation. To produce mechanically perfect electrolytic metal, it is therefore necessary either to maintain the chemical compound of iron, such as ferrous hydrate, in its original beneficial form, or to eliminate the iron entirely from the bath. The latter scheme is the more practical.

Purifying the Electrolyte. Chlorination in the presence of the nickel hydrate destroys organic material, and removes all of the copper and nearly all of the iron. The last trace of colloidal ferric hydrate may be removed by heating the bath slowly with a fresh charge of nickelous hydrate and hydrogen peroxide, and then filtering. If this bath could now be operated sealed and an absolutely pure nickel anode employed, no trouble would be experienced in making perfect cathode metal. But such a procedure is at present commercially impracticable.

[3] Trans. Am. Electrochem. Soc., 39, 466 (1921).

Anodes. Absolutely pure nickel does not become passive under electrolysis as has been reported by others in the past. The passivity effect observed is due to traces of Cr, Mn and Si in the nickel, together with the variable areas of variable small oxygen content. These impurities are present in nearly all commercial nickel, and even the best rolled malleable nickel contains both manganese and oxygen.

In the carbon eutectic anode referred to above, all metallic impurities have been removed, except a mere trace of iron, and the total absence of oxygen is insured by the high carbon content. But unless this anode is made with extreme care there will be free graphite present, which will cause trouble during subsequent electrodeposition.

Strange to say the extreme opposite practice with regard to oxygen also applies; that is to say, if all traces of the injurious metallic elements have been removed, then an extremely high oxygen content will aid solubility of the anode. But such an anode may throw off colloidal particles of metallic nickel and Ni_2O_3.

Operating Factors. Using Dr. O. P. Watts' bath[4], purified as described above and kept at 55° C. (130° F.) with a current density of 36 amp. per sq. ft. (4 amp. per sq. dm.) and with the last described anode, the addition of 1 to 4 cc. of a 3 per cent H_2O_2 solution per L. of bath initially, and then 4 cc. every 24 hr. of operation, insures absolute freedom from pits. Under these conditions accurate pH control is not necessary, provided the pH is kept well on the acid side. Its value may be lower than formerly supposed to be, but this may be accounted for by the fact that the value is somewhat dependent upon the actual H_2O_2 concentration. A pH between 3 and 6.8 is permissible, but pH 6.2 to 6.6 is to be preferred, as the removal of ferric salts is facilitated under these conditions.

Good nickel metal can be produced at from 20 to 144 amp. per sq. ft. (2 to 15.5 amp. per sq. dm.), but 36 amp. per sq. ft. (4 amp. per sq. dm.), corresponds to the thermal balance under usual commercial operating conditions. If the bath is operated without agitation and filtered every 24 hr., the metal will be about equal to that of poor brass, but if continuous filtration be used an electrolytic nickel can under the above conditions be deposited up to one inch in thickness, free from all carbuncles and pits, and which will have a ductility both before and after annealing nearly equal to that of pure gold.

CONCLUSIONS

1. Perfect electrolytic nickel can be produced from a bath containing absolutely nothing but nickel salts and a litttle free acid, by using an anode containing absolutely nothing but nickel.
2. Perfect electrolytic nickel can be produced from a bath made from commercial nickel salts and using an anode low in iron, but otherwise pure, by the use of hydrogen peroxide in the bath.
3. Accurate pH control is made necessary only by the presence of iron.
4. In the deposition of nickel from aqueous electrolytes a high bath temperature is necessary for best results.
5. The cause of "carbuncles" is suspended impurities in the electrolyte above colloidal size.
6. Organic material is the chief cause of brittle or otherwise poor nickel deposits.
7. Under proper conditions nickel metal can be electrodeposited having a ductility approaching that of gold.

My research on electro-nickel has extended over a period of about eight years. During this period valuable suggestions and encouragement were received from Messrs. Fred. G. Cottrell, Colin G. Fink, J. W. H. Randall, Wm. Blum and George B. Hogaboom.

[4] Trans. Am. Electrochem. Soc., 29, 396 (1916).

British Impressions

Further Opinions on Industrial Conditions in Great Britain as Viewed by an American Brass Foundryman

Written for The Metal Industry by THOMAS HARPER, Brass Foundryman, New York

I was very much interested in the apparent reactions of the committee of the Institute of Metals as shown in the reply of their secretary, Mr. G. Shaw Scott, to your letter of February 27 in regard to the article on "British Impressions."

They seem to have become very much excited over the idea (a mistaken one) that a guest of theirs, a member of the American Foundrymen's Association, whom, according to their letter, they had entertained so highly, had dared to criticize conditions in Great Britain. It looked to them like a gross violation of their hospitality and that the manners of Americans were very crude. They must have been running around in circles.

Figuring from the date of your letter, February 27, allows nine days for mail to Britain, nine days' mail to this side again, and one day for a cable up to March 18, the date of their reply to you when it dawned on them that I must have traveled as an individual—that person, Mr. Harper. And they did as every Englishman does when he is up against anything he cannot controvert or in any way assails his position in the eyes of others. They immediately reacted to their natural condition of hauteur, and in effect replied to you in the March 18 letter that if you hadn't spoken they would never have known I was there.

The editor's note was correct. I traveled frankly as "that person, Mr. Harper," accompanied by my son and daughter, and I never claimed to be a member of any party, or a member of the American Foundrymen's Association. I am not. I have always traveled as an individual, never a member of a personally conducted party, that only see what is shown to them, and only hear what they are wished to hear.

On the other hand, had we not traveled as we did, think what we would have missed. In those three months our speedometer showed that we covered about 4,000 miles, practically going from one end of Britain to the other, zig-zagging to different points of interest, going where we wanted, stopping when we wanted, taking snapshots of whatever interested us, always something new or old, great or beautiful to see, a veritable kaleidoscope of variety, interest and surprises.

The statements I made in the February article of THE METAL INDUSTRY in regard to output of labor are confirmed in a book written by Lord Milner. This book was reviewed by the New York Times of January 29, 1924, a few days after I had mailed by article to THE METAL INDUSTRY, and too late to be quoted in that article. I stated that the impression made on me was that workers were inefficient in their work and that the workers I had observed did not do one-third of the day's work that is done in the United States. They received, therefore, only one-third of the wages, and as living or commodity costs were world costs, or as high as in the United States, the scale of living for workers could be only one-third of that of workmen in the United States.

The reviewer of Lord Milner's book said, "He takes a melancholy view of the British Empire and states that the advocates of Labor generally begin and very often end their pleadings with attacks on the unfair distribution of wealth produced. But an annual income of 1,500 or even 2,000 million pounds does not spell prosperity for fifty million people." Translating this into American currency, $4.00 per week per capita is not the millennium. Lord Milner then quotes from the British and the United States census of production of a dozen years ago. The British workman produced goods worth £103 per annum, while his American competitor produced goods worth £262. For this situation he blames capital and says it is due to the greater use of machinery in the United States where the average horsepower is 2.8 per worker, compared with 1.5 for Britain.

With all due respect to Lord Milner, he is putting the blame unfairly when he places it on capital alone. Taking his £103 and dividing into 1.5 horsepower you will get 1.456% of a horsepower per pound of value for Britain's output and £262 divided into 2.8 horsepower will give 1.07% of a horsepower per pound of value for the United States output, or nearly one-third less horsepower is used in the United States than in Britain to produce a pound value of production. This seems to show that British labor does not fully use the machinery and power furnished in comparison with the United States, and shows a very low efficiency in the use of power especially. For this reason labor has to accept lower wages on account of the increased overhead for power to enable the output manufactured by its aid to be sold. This also proves the British workman's lack of efficiency or lack of capacity to work even when furnished with power, like the difference in output of other workmen using little or no power, such as bricklayers, foundrymen, etc. It shows that British workmen today are, as an average, paid for all that they produce for exchange with themselves or the rest of the world at world prices, and if they continue to "ca canny," as their statistics show that on the whole they are doing, they will continue to live on the "verge of starvation," as Lord Milner says they are now doing.

I think there are industries in Great Britain that are as thoroughly organized both in machinery and power as the same industries in the United States or any country in the world. But that could only be determined by a comparison of the statistics of the individual industries with those of another country such as furnished by the United States for the brass, copper and allied industries. The United States Census Bulletins show the material cost, the wages and salaries paid, the value added by manufacture and the number of persons engaged, and from these you can figure out pretty closely, in comparison with other countries, the status of an industry on the average, if labor is producing sufficient for the wages paid, or if labor is getting too little for what they produce, if salaries are too high or too low in relation to production, if materials are too high, if costs of marketing are too high, and if profits, dividends or interest on capital is too high or too low, and if the industry is well or poorly organized. Lord Milner should not, like the labor advocates, blame the low wages of the British industries on capitalists without making an inquiry really to determine relative conditions and see where the blame lies. At the present time this might not be so difficult to determine as the British Empire Exhibition, now being held, should result in a stocktaking that would be valuable for the purpose. From this accumulation and comparison of statistics the true conditions of employers in relation to labor and consumers could be shown, and the position of labor in relation to their employers and

as consumers. It will show that labor, being both workers and consumers, their standards of living are controlled by themselves alone.

But through it all runs the human element, the endless milling around on High Streets, Crosses and Market Places of a confused, dissatisfied, longing, but orderly, hoping crowd of perplexed men and women. In snatches of talk with them I found that America was the land of opportunity to them. The further it was away from their reach the better is looked. I tried to tell them that the opportunity they would get in the United States would be to join with others there and work three times faster and more efficiently than they had ever done, or were doing, in Britain, and they would get three times the wages for producing three times the output; and if they did not meet those conditions and continued to "ca canny" they would naturally slide to one side down into the slums and have no better living conditions than they have in Britain now. I told some of them that right in Britain there could be developed as great an opportunity as existed in America if they, the workmen and the Labor Unions would join together with the employers to treble the present production done now, and work with their hands and their brains to increase production. And this is true of every other country.

They could not visualize it; there must be something else, something in the air, the country, or the laws, that did it. They worked with their hands and their brains as well as Americans. "You do not or you would produce more," I said. The Scotchmen would ask for my proofs. I would tell them what I had seen, etc. (Practically all that was said in my article published in the February METAL INDUSTRY.) But they were not convinced; that indefinable something else, not work on their part, would do it. So they are still groping around and look to the Labor Party for relief.

This idea of something subtle in the climate is fostered by British writers (probably as an excuse for inefficiency) and commented on favorably and otherwise by our visitors from the other side. It is blamed for American initiative, its audacity in its plans and schemes, for its go and vigor, for everything, good and bad, honest and fraudulent.

One of the latest to write a book on America and encourage this idea is Hilaire Belloc. In his book "The Contrast," he says: "It was in crossing the Grand Banks that I discovered this new air. I was appalled and vaguely intrigued. I was coming to new things. It was in what I breathed and in the quality of the wind."

To a healthy person, recovery from seasickness acts as a fine tonic. I am sure if he went across the border to Mexico he would not find any of that wind, but there is plenty blowing from and through California to Texas, and all the border states on the American side.

In another part he says that after many visits to America he remained away twenty-five years, and then says: "In my last brief glimpse I discovered beneath all the superficial growth and change the same profound underlying spirit, the same personality—the soul which is not ours. The creative spirit of the place, that which, really, though hiddenly, moulds men and things and makes us all the children of our own land."

Here again is the excuse for inefficiency. Here again is the searching for the subtle something of soul or air or spirit instead of looking for a practical, **real creative spirit of America, which hiddenly molds men and things and is** the profound underlying spirit. He deals in vague imaginings. The real and material foundation on which rests all of America's growth, change and development, all of its industrial prosperity, is the urge to personal development, and it follows the development of all other forces that can be used for either personal benefit, national benefit, or the benefit of humanity. This is embodied in Section VIII, Clause 8, of the Constitution of the United States, which I think was written and inserted by that author, inventor, scientist and philosopher, Benjamin Franklin, and probably with but little promonition of the great, valuable and far-reaching service he had rendered to the American nation.

It reads, "To promote the progress of science and useful arts, by securing for limited time to authors and inventors the exclusive right to their respective writings and discoveries."

And when you add to the above, "All men are born free and equal," you have the soul that is America.

That the patent laws of Great Britain are inadequate for the development of their industries, and of little value or encouragement to working men to develop their ability to think out problems logically is shown by the small number of British patents issued up to April, 1924—211,840, against 1,490,549 for America. I think this proves that the cost of British patents is too high, the protection too slight, and the time too short. The British patents are really only a registration of an invention and granted to the first to disclose it, while in the United States they give a certification that he is the original inventor, and this is something in its psychological effect that has been, still is, and always will be **essential,** in the building **of the soul that is America's.**

If Ramsay MacDonald or any premier of Britain wants to do something of real benefit for labor now, and the nation in the future, let him work for laws that will be an urge from boyhood to old age for personal development and which will offer rewards for the successful. And the first that should be enacted is a new patent law, even stronger and cheaper than the American law, so that anyone, even the poorest, can pay the fees for protection. The British working people will develop an initiative and ability to achieve, or to do, and create an environment that has been latent for years. It has been latent because of the moron propaganda that "the world owes them a living whether they work for it or not."

If Ramsay MacDonald or any other premier of Britain has any doubt of the value of Section VIII, Clause 8, and he does not feel assured that it is one of or the only great fundamental reason of differences in the spirit of the workers of the two countries, let him verify for himself that in America there are millions of boys, young, and old men who are interested in radio and building sets, and in Great Britain my impression is that it is practically unknown among working people; that any city of even less than 100,000 people in America will show more private aerials than the whole of Great Britain.

It cannot be doubted that the interest and study in this subject is but the fruition of our patent laws and that this study will benefit the nation mentally, building up individuality and initative through the training it will give each experimenter in straight thinking in his attempts to solve problems, will give them faith in themselves, develop the will to achieve other things and will energize the whole people. And the "pleasures of hope" that will accompany those endeavors! Hope that they might be so fortunate as to parallel in some measure the spectacular achievement of young Armstrong with his regenerative receiver or to do something is striking as Edison and Bell did forty-five years ago and a great many men since, and win both fame and fortune through an invention worthy of a patent and worth while doing.

But if it is thought the boys and youths in Great Britain are slow or lacking in energy let anyone interested look over their troops of Boy Scouts or meet the youths on their bicycle, hiking and camping trips. I have met them at Ben Nevis, Loch Lomond, Glencoe, the Caledonian Canal, the

Trossachs, in Burns' country and Walter Scott's in the north; on their trips to London, to the Lake country, Wordsworth's country, Shakespeare's country, Oxford and Cambridge. Or go to the commons or links, the parks, greens, or to empty lots or on side streets. Then compare them with American boys under like conditions. You will find the same leather-lunged energy and intensity in competition with one another. Watch them in boat races or in a marathon race. One hundred may come to the scratch to run for five prizes. Some are left helplessly along the road. The winner may get a dilated heart in his efforts. No matter, they are glad to have come through. The contest is the thing. The prizes only lend zest and are the hallmark of successful endeavor.

The urge for roamings and the contest are but the visible outbursts of the spirit, the idealism, the soul of the youth of Britain. But after entering manhood, their ambitions and their idealism get shriveled up into aristocratic hauteur and "ca cannyism" and the **soul that is Britain's** along with it.

In America as in England we have pleadings by the advocates of labor and "moron propaganda" of the unfair distribution of wealth produced. I am sure that an examination of the statistics of both Britain and America will show **that the most of employers are working more for the benefit of their employees and consumers than for themselves,** not from altruistic motives, but as a matter of fact.

From the ranks of the workers are graduated (by self-selection) most of employers. The ambition is to attain a higher standard of living. What are the obstacles he has to overcome, the facts he has to face, to survive and always pay one hundred cents on the dollar? He has to buy labor and services from labor and sell (no matter how circuitous the channels) mostly to labor as the ultimate users of his product. He has to meet the competition of those firms that go through bankruptcy or settle with creditors for twenty cents on the dollar or less; and when his customers fail and go bankrupt he has to meet that loss, pay par and still meet competition.

If he is still able to go ahead and make more profit than a living wage he is confronted with the graduated income tax, both State and Federal, to cut his income down. The result is, as statistics show, that before the present income taxes were imposed on business, ninety-five per cent of manufacturing firms failed inside of twenty-five years. These ninety-five per cent are mostly due to selling below the cost of manufacturing and distributing the goods—the services rendered—**at no profit.**

That means that ninety-five per cent of the wealth produced has been distributed to the consumers free from any possible attack for "unfair distribution of wealth" by the competitive system now in use. Does it sound feasible that the labor advocates could give a higher efficiency than ninety-five per cent? They would have to draw their executives from the same class or with the same mentality as the ninety-five per cent of failures came from and five per cent of successes. Is it not more probable that instead of showing that amount of efficiency they would run true to form and only show an efficiency of five per cent and failures of ninety-five per cent under the Socialist theories or methods of distribution of wealth?

All business men in the United States have been looking to Congress and the Senate for some measure of relief from the burden of taxation. How can they expect substantial or intelligent relief when they know that the men who select themselves as Congressmen or Senators and as the people's representatives are graduates from the same class and have the same average mentality as the average business men? And ninety-five per cent of business men are failures. It's good to have some men of uncommon sense in the government even if it may only be five per cent.

The conditions are much the same in Great Britain with the difference that Great Britain has been unable to achieve the same industrial prosperity for her workers that America has. This is due to the assumption of superiority, condescension and aristocratic hauteur on one side, and the natural reaction by the workers against that position or air of superiority as is shown by the reduction of output and "ca cannyism" to the "verge of starvation," or, in other words, cutting off their noses to spite their faces. This makes the British people, rich and poor, employers and employed, a very sick people—sick from the worst of all diseases—**self-pity.** Can the Labor Party put them on the way to recovery? I have my doubts. They will have no higher average of mentality in the Labor Party than the average of the parties that have preceded them, and unless they are fortunate in selecting a man of uncommon sense as their leader and do not throw down his recommendations for the sake of votes they will do no better.

What I would like to see and what I think is possible is an England and Scotland as prosperous as America. America is conceded to be the most prosperous country in the world both for employers and workmen. Its workmen and salaried men are the highest paid and have the highest standard of living in the world, and the standard of living is still going up. The present shortage in housing is not altogether due to the natural increase in population, but is due to the demand for larger and better accommodations by the workers. Millions own their own homes and automobiles. They have millions of dollars invested in industrial companies' stocks, companies they are employed by, and companies that sell their product to them. The whole capitalization of the new labor banks is owned by labor. In addition, the billions of dollars of investment capital of the savings banks and the life insurance companies are the savings of the working and salaried.

The reason they have all this and can do all this is because they turn out the largest production per capita, and for that receive the highest wages in the world.

Why can't the British do as well?

If they did as well, and turned out as great a production value per capita as America does, and gave themselves a higher standard of living and showed other nations how it could be accomplished, **"with benefit to all the people and injury to none,"** we would hear less of those claims that I heard all over Great Britain; claims, which are, I suppose, common over the rest of Europe, that Americans are profiteers, and they are receiving an "unfair distribution of the wealth produced" in the world.

These same critics are the most insistent that it is America's duty to come into the League of Nations and give assistance to the nations of Europe through this League (an International Court does not appeal to them). For through their votes they might be able to shift their burdens to us, cancel their indebtedness to us, or repudiate them in some way; or through some form of an Income Tax among nations assess America for the **excess profits** it makes in comparison with less industrious nations and thus "deprive us of property rightfully ours without just compensation." This would be contrary to Article V of the Constitution of the United States, but their claim would be that world laws are superior to national laws, as Japan has just claimed in regard to immigration.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers, Inc.

Published Monthly—Copyright 1924 by THE METAL INDUSTRY PUBLISHING COMPANY, Incorporated

Entered February 16, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

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Vol. 22 New York, August, 1924 No. 8

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EDITORIAL

THE TREND IN THE SCIENCE OF METALS

The trend in the science of metallurgy seems to be growing more and more in the direction of concerted, planned and carefully laid out campaigns by organizations which are equipped and financially able to carry on extended and intricate investigations. At a time not so long ago most advances were made by scattered contributions, in many cases accidental discoveries. These contributions were along the line of facts hit upon by men who were not essentially investigators, but who simply recognized unusual phenomena when they were confronted by them.

A vast number of our present alloys are due to this process. To be sure the large majority of such alloys are either not used or superseded by later discoveries, but the fact remains that much of the early development and perhaps even a fair portion of our present gains are due to this hit or miss process.

With the growth of knowledge and the increased confidence in research and systematic investigation shown by large manufacturing organizations a new element has taken the upper hand. The extraordinary research laboratories of the General Electric Company, the Western Electric Company, the Eastman Kodak Company and others of a similar nature and the work done by such organizations as the Mellon Institute have placed industry as a whole, and metals perhaps as much as any other, on a new footing.

From now on it may be confidently expected that a larger and larger proportion of new discoveries will be due to the systematically planned and carried out efforts of organized investigators rather than scattered accidental discoveries. The really vital problems of metallurgy in the future will probably be solved in this way. Corrosion is being attacked on all sides and its attack will increase in scope and intensity. X-Ray analysis has opened up an enormous field not only for speculation, but for actual fact finding. Its great contribution to metallurgy so far has been its explanation of the atomic construction of matter, making it possible to proceed more directly and to carry on practical investigations in a much clearer light. The study of fatigue also lies largely before us and effects of the so-called rare metals on the common metals, although far advanced over what was known a few years ago, is still a fertile field for work.

Along with the more or less abstract research must go the practical investigations of metals and alloys for industrial uses and the determination of their properties such as resistance to corrosion, electrical conductivity, magnetic properties, melting point, vapor pressure, bearing qualities, machinability, coefficient of expansion, strength, elastic limit, hardness, elongation and reduction of area, resistance to repeated stress, resistance to impact and so on.

There is no doubt that as we go on a growing body of information will be built up and properly tabulated or catalogued so as to make it possible for the user of metals to determine beforehand, with a fair degree of accuracy, what material is best suited for his purposes.

CORROSION RESISTANT ALLOYS

The great advance of corrosion resistant alloys in the last decade has opened up many new fields of endeavor in the metal industries. For a time it seemed as if the field was to be confined to non-ferrous metals, nickel, chromium, cobalt, and so on, but within the last few years these metals have experienced very considerable competition from steel of the "stainless" or "rustless" alloy varieties.

The most important of these alloys are the iron chromium mixtures. Although old in principle their recent advance has been most important and in many ways startling. Additional agents as tungsten, nickel and cobalt have been used, but the basic rust resisting factor seems to be chromium.

It is perfectly possible to make an alloy with very high corrosion and rust resisting qualities in a number of ways, whether the alloy is made of steel or non-ferrous metals. The limiting factor, however, seems to be that of expense, and following that, the difficulty of working. A great many alloys protect themselves by a film of oxide which checks further corrosion, but this property is of little avail where the conditions under which the alloy is placed demand resistance to friction as well as corrosion, since the friction removes the rust resisting film.

In a paper read before the American Society for Testing Materials by P. A. E. Armstrong on Corrosion Resistant Alloys, Their Past, Present and Future, With Suggestions as to Future Trend, it is predicted in a general way, that 17 per cent chromium alloyed with iron along with silicon about 1.5 per cent and carbon under .10 per cent will be received with increasing favor by structural designers and probably will be the leader as the most effective rust-resisting iron of the future. It behooves those interested in non-ferrous metals to bestir themselves to retain the fields for which these alloys are primarily suitable. They have, of course, the outstand-

ing disadvantage of dealing with more expensive raw materials, but this is partially compensated by the fact that the corrosion resisting factors in steels are also very expensive.

The future of corrosion resistance is still very hazy, but an enocuraging fact is evident in the interest displayed in these alloys by technical societies and industrial manufacturing companies.

METAL INDUSTRY IN NEW YORK

A survey made by the Committee on Regional Plan of New York and Its Environs for the Merchants' Association of New York discloses some interesting and perhaps disquieting facts about the iron and metal working industries in the New York district. The subject is of unusual importance due to the fact that more than 250,000 workers are employed in these industries in this district, and together with their dependents they would total from 750,000 to a million people affected by any change.

According to this report there seems to be shown a strong tendency to move from Manhattan and Brooklyn to New Jersey and Queens. This is partially due to the high cost of property and consequent high rents, and perhaps also to the higher cost of labor within New York City proper. Another point is probably the fact that the most economical manufacturing is done on one floor level. As soon as it is necessary to move materials up and down a building the cost of handling rises much faster than the actual distance covered by the materials would warrant.

The report covers manufacturing plants ranging from pins to printing presses and from platinum rings to plumbing supplies. It was found that the tendency to move was strongest among the plants manufacturing heavy or bulky products. This is understandable, of course, in view of the fact that small light articles can be made in considerable quantities in one loft of a city building. It is stated that there are now only five iron foundries on Manhattan Island, whereas there were at one time sixty-five. The plants producing heavy and bulky products on Manhattan Island south of Canal street have fallen in number from 35 to 12 in the last twenty-two years. The heavy metal working plants in the southern portion of Manhattan Island have been reduced by half since 1900. On the other hand, the metal working industry in New Jersey has grown steadily. The only part of Greater New York which is increasing its industrial population is the Borough of Queens.

The jewelry industry seems to be exempt from this movement. Fully 85 per cent of the fine jewelry of the entire United States is still made in Manhattan and there seems to be no drift away from this location. Newark, New Jersey, accounts for about 95 per cent of the medium priced jewelry.

If, in speaking of New York, one includes the Metropolitan district or all towns within an approximate radius of fifty miles, New York has not suffered particularly and still would seem to be holding its own. Sixty per cent of the aircraft built in the United States and 55 per cent of the copper refining are still done in this district. The increased transit facilities, both urban and interurban, have made it possible for manufacturing to spread out of New York City proper, into outlining districts, at the same time keeping New York as their practical headquarters.

EYE SIGHT CONSERVATION

A bulletin issued by the Eye Sight Conservation Council of America states flatly that industry is neglecting the eyes of the workers and bases its conclusions on a survey embracing 170 companies located in 23 states and employing more than 1,000,000 men and women. The report states that the average proportion of defective vision is 44.3 per cent and it is claimed that this percentage is a fair sample of the situation among the 42,000,000 persons gainfully employed in the United States.

Evidence is given that very few companies have provided for the examination of the eyes of their employees either by selection at the time of application for employment or by regular periodical examination and treatment of employees. Inquiries sent out to 750 establishments who were already doing safety and welfare work illicited only 229 replies. Of the 170 replies which gave any real information only 57 per cent, or 97 companies, stated that eyesight tests were given.

Of course, railroad companies have always made it a business to test the eyes of their employees since the lives of passengers depend upon them. But it is claimed that not more than 100 or 150 companies in the United States employing over 1,000 persons consider it necessary to test the eyes of new employees. Even fewer companies give regular tests for permanent employees. Those who do carry on such activities report that as high as 66 per cent of the employees in their establishments have defective vision.

The Eye Sight Conservation Council makes the following statements which need no further comment.

"Eyesight, as an important factor affecting the output of the industries of the United States, is being overlooked. Comparatively few industrial and commercial establishments are giving any attention to the care of the eyes of their employees.

"Those companies that recognize their responsibility in this regard not only realize inestimable benefits, but are likewise contributing tremendously to the physical upbuilding of society. Such remedial measures as the correction of visual defects, safety campaigns for the protection of the eyes from hazards and accidents and improvements in lighting conditions are results which no company can afford to overlook.

"Production is increased, the quality of workmanship is improved, less material is wasted, fewer accidents occur, greater individual effort is made possible, and, above all, there result greater physical comfort and contentment."

New Books

Electro Deposition of Metals. By Langbein and Brannt. Published by H. C. Baird & Company. Size 6¼ x 9¼, 875 pages. Price, payable in advance, $7.50. For sale by THE METAL INDUSTRY.

This is the 9th corrected edition of a standard work familiar to all platers and electro-chemists. While it is in the main a translation of Dr. Langbein's work it gains by the additions, among which are a chapter on apparatus and instruments and a section of useful tables. Special attention is paid to the latest innovations in machinery, such as plating machines; ball-bearing grinding and polishing lathes; sand blast apparatus for cleaning, and lacquer spraying by compressed air. It also considers the use of electrically heated japanning and baking ovens and the latest practice in plating dynamos and storage batteries.

This work has been covered a number of times in these columns and needs no further praise. It is sufficient to say that the 9th edition is larger, more complete and more up-to-date than any of those previously published.

Year Book of the National Association of Cost Accountants. Published by the National Association of Cost Accountants. Size 6 x 9; 377 pages. Price, payable in advance, $3. For sale by THE METAL INDUSTRY.

This is the annual compilation and transactions of this society, an organization of 3,300 cost men and business managers in the United States, Canada and foreign countries.

The technical sessions of the Convention which are reproduced in full in the Year Book are:

"Methods of Wage Payment as Related to Costs."

"To What Extent and in What Manner Should Detailed Cost Figures Be Given to Department Heads?"

"Actual Examples of the Advantageous Use of Operating Budgets."

"On What Basis Should Raw Material Be Charged Into Production Costs?"

"Should Detailed Cost Work Be Centralized in the Head Office?"

"Relation of Planning and Dispatching to Cost Accounting."

"How Far Is It Proper for a Trade Association to Distribute Cost Information Among Its Members?"

It will be noted that these subjects are not academic, but live practical questions demanding solution in the business world.

The book also contains a report of the officers and directors, and a list of members. It is extremely interesting to anyone connected in any way with the problem of cost finding in a foundry or a manufacturing plant.

Steinmetz and His Discoverer. By John T. Broderick. Published by Robson & Adde. Size 5¼ x 7½; 24 pages. Price, payable in advance, 50c. For sale by THE METAL INDUSTRY.

A vivid account of how Dr. Steinmetz became a power in industry. A sketch of the man "his messages and achievements which carried the meaning of electricity as an agency for service to the frontiers of civilization." The book is short, of course, and simply summarizes in the briefest possible fashion, the work which Dr. Steinmetz developed. It describes the meeting between Dr. Steinmetz and E. W. Rice, Jr., and summarizes the tremendous development of electric equipment during his period and the work which Steinmetz developed in advancing it.

Vanadium Ores. By the members of the Scientific and Technical Staff of the Imperial Institute. Published by John Murray, London, England. Size 5½ x 8½; 72 pages. Price, payable in advance, $2. For sale by THE METAL INDUSTRY.

This is one of the monographs on mineral resources with special reference to the British Empire. It was prepared under the direction of the Mineral Resources Committee of the Imperial Institute, and covers the subject of vanadium ores, including their occurrence, character, uses, sources of supply, both British and foreign. A bibliography of literature on vanadium is appended.

Technical Papers

PERMANENT MOLDS

By ROBERT J. ANDERSON AND M. E. BOYD

This is an American exchange paper read at the Annual Conference of the Institute of British Foundrymen in Newcastle, England.

In this paper the production of castings in permanent molds is discussed in a general way, and the applications and limitations of the process to both ferrous and non-ferrous casting have been pointed out. The history of the permanent-mold process has been sketched briefly, it being pointed out that permanent types of molds, including stone and bronze molds, were used as long ago as 3,000 B.C. Typical examples of such old molds are shown. The development of the permanent-old process in recent years has been reviewed briefly.

It has been indicated that there are five separate and distinct casting processes involving the use of permanent or metallic molds, viz: (1) die casting; (2) slush casting; (3) Cothias casting; (4) centrifugal casting; and (5) permanent-mold casting. These different casting processes are defined, and the first four are discussed briefly, and then compared with the true permanent-mold casting process, which is the counterpart of sand casting. It is explained that the permanent-mold process is the same as the sand-casting process in method of operation, and the chief difference lies in the type of mold employed. The use of permanent molds is desirable, since in sand practice each mold is destroyed on pouring, and a mold that can be used over and over again is required, especially in repetition work involving large numbers of castings.

The general principles of the permanent-mold process have been discussed, and a typical permanent-mold is described as illustrative of these principles. Some typical examples of permanent molds are described, and the four main types of molds are discussed. It has been pointed out that very many patents have been issued for claims bearing on permanent-mold casting, and a short list of patents is given.

The question of materials employed for making molds and cores is taken up, and it is pointed out that gray cast iron is used largely for the mold body proper, while both metallic (collapsible steel) cores and sand cores are employed. The growth and distortion of gray iron molds in service is discussed briefly. The use of refractory linings and coatings for permanent molds is discussed.

The design and preparation of molds and methods of gating are taken up in a general way, and the main principles of mold preparation have been discussed.

Finally, the various types of alloys used commercially for casting in permanent-molds have been considered, and the types of castings made in these alloys have been described.

MOLDING SAND RESEARCH

This booklet covers the tentatively adopted methods of tests and a resumé of activities of the Joint Committee on Molding Sand Research of the American Foundrymen's Association. It includes the following reports: Chairman of Joint Committee; Sub-Committee on Geological Surveys; Sub-Committee on Conservation and Reclaimation; Sub-Committee on Testing Methods.

These tests are reviewed: Bonding or Cohesiveness; Permeability; Fineness; Dye Absorption; Chemical Analysis of Molding Sand; Method of Sampling Sand; Testing Equipment.

INTERNAL STRESS IN BRASS TUBING

By R. J. Anderson and E. G. Fahlman

Technologic paper of the Bureau of Standards No. 257. The investigation discussed in this paper was carried out at the Pittsburgh Experimental Station of the Bureau of Mines in connection with related metallurgical studies on brass. However, since the nature of this phase of the work falls within the province of the Bureau of Standards, by special arrangement it is reported here rather than as a publication of the Bureau of Mines.

A new method for the quantitative estimation of longitudinal internal stress in tube shapes (for example, cold-drawn brass tubes), showed that the major stress is longitudinal, and the stress in the outer part of the wall of the tubing is a longitudinal tensile stress, while that in the inner portion is a longitudinal compressive stress. The summation of the balanced stresses, of course, is zero. Absence of circumferential stress in tubes is indicated by the failure of diametrically cut rings to spring in or out on being slit in two. Experiments showed that the usual cutting methods which have been applied to bars and rods for the estimation of stress are not applicable to tubes, especially where the bulk of the stress is longitudinal.

The method described in the paper for measuring longitudinal internal stress is called the strip method, and is carried out by slitting a narrow strip longitudinally in a piece of tubing; for example, a strip 2.75 inches long and 0.10 inch wide in a 3.25-inch tube length; and then releasing one end of such a slit strip by cutting. Stress is indicated by the springing out of the freed end and can be calculated by a formula based upon the modulus of elasticity of the material and the distance in movement of the freed end.

The method is useful for determining the amount of internal stress in cold-drawn tubes, and for examining quantitatively the effect of a low-temperature anneal upon stress release. It has often been thought that because cold-drawn brass does not crack on application of an accelerating cracking agent it is free from internal stress. The strip method is applicable for the quantitative estimation of stresses inferior to those necessary for cracking under the application of mercurous nitrate.

PHYSICAL PROPERTIES OF MATERIALS

Circular of the Bureau of Standards, No. 101, on Strengths and Related Properties of Metals and Wood. Second edition.

This circular contains the values for tensile, compressive and shearing strengths; ductility; modulus of elasticity; and other related properties of pure metals and their alloys and of wood. In addition to these the properties of metals at elevated temperatures, their fatigue and impact properties, and the effect of heat treatent and cold working are given.

Other properties and uses of less commonly used metals are described briefly. Graphical representation is used in many cases to show the change of the properties of a material with changing conditions. References to the sources are given for for all values in this circular.

This circular can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 40 cents.

ENGINEERING STANDARDS COMMITTEE

The Year Book of the American Engineering Standards Committee for 1924 covers its work for that year and outlines the growth and usefulness of that body. The number of projects which are under way or which have been completed and the standards improved is 152. There are 235 national bodies, technical, industrial and governmental cooperating in work through officially accredited representatives. The number of individuals serving on sectional committees is 1,081. Of the projects which have reached an official status, 25 have to do with mechanical engineering; 15 with nonferrous metals, and 12 with chemical subjects.

This booklet can be obtained from the American Engineering Standards Committee, 29 West 39th street, New York City.

PURE ZINC ANODES

By Oliver W. Storey

This is a paper read before the Milwaukee meeting of the American Electro-Platers' Society, June 30-July3, 1924. The author asks the question, "Do zinc anodes pay?" and answers it with an emphatic, "Yes." He quotes tests made in the C. F. Burgess Laboratories, Madison, Wis., to prove that the use of pure zinc anodes has been able to effect a saving in zinc cost of 33 per cent over the zinc cost when anodes of ordinary purity were used.

ECONOMICS OF THE COPPER, BRASS AND NICKEL-SILVER INDUSTRIES IN 1924

By George W. Mullins*

The author covers the economics aspects of the metal industries in England, enumerating various problems. He touches upon the trend of metal prices; the possibilities of increasing the uses of metals; labor problems; research and the problem of raw materials, that is the quantities in sight, and the possible using up of these materials.

METALLURGICAL RESEARCH IN GOVERNMENT LABORATORIES

By J. L. Haughton*

The author reviews the metallurgical research of government laboratories in their three classes: (a) fundamental research, which is undertaken to increase the general knowledge of metallurgical facts rather than to solve any special commercial problem; (b) research undertaken for the definite and special purpose of increasing the efficiency of the fighting services; (c) research carried out to enable a particular manufacturer or group of manufacturers to overcome some of the difficulties in their processes, to improve their products, or to reduce the cost of manufacture.

LIGHT ALLOYS OF ALUMINIUM

By W. Rosenhain and S. L. Archbutt*

A review of the research on light alloys of aluminum which has been in progress in England for some twenty years, particularly work done by the National Physical Laboratory before 1914 and the general investigations after that time. The following alloys are reviewed: copper-aluminium; zinc-aluminium; silicon-aluminium; copper-zinc-aluminium; magnesium-nickel-copper-aluminium; heat treatment.

METALLURGICAL EDUCATION OF UNIVERSITY RANK IN GREAT BRITAIN

By H. C. H. Carpenter*

The main purpose of this paper is to present in a compact form an account of the facilities for metallurgical education including research, which are to be found in England. The author includes a brief historical summary curriculm at the Royal School of Mines; University of Sheffield; University of Birmingham; Royal Technical College of Glasgow; Armstrong College, Newcastle-on-Tyne; University College, Cardiff, Wales; Victoria University, Mancheseter; Department of Metallurgy, Leeds University; Goldsmith's Metallurgical Laboratory, Cambridge; Metallurgical Department, Liverpool University; Metallurgical Department of the University College, Swansea.

* A paper read at the Empire Mining & Metallurgical Congress, London, June 3-6, 1924.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { WILLIAM J. REARDON, Foundry; JESSE L. JONES, Metallurgical; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research

ADDING MANGANESE TO BRASS

Q.—In certain work we add two (2) ounces of aluminum to crucible of 125 lbs. of scrap brass just before pouring to facilitate casting. Can you tell us how to use manganese and in what proportion as an addition to the mixture? We are given to understand this will help to overcome some of the disadvantages of using aluminum this way.

A.—From your letter we just can not tell what you want to do; add metallic manganese to your alloy or add the aluminum through manganese bronze so as to overcome the difficulties so often run into by adding aluminum to any metal containing lead.

If you desire to add metallic maganese, we suggest you add it in the form of 30 per cent manganese copper, figuring the amount of manganese you desire to add to your alloy.

On the other hand, if you desire to add the aluminum to manganese bronze, the best way to introduce the aluminum would be to make a mixture of 90 per cent copper and 10 per cent aluminum, pour in ingots and add the desired amount of aluminum through the aluminum bronze alloy, and you will make considerable improvement in your alloy.—W. J. R. Problem 3,258.

BLISTERED GOLD AND SILVER

Q.—We do a large amount of gold and silver plating on brass and have considerable trouble with blistering, this generally showing up in burnishing. What other than the surface not being clean, can cause this? What is your opinion as to best cleaner to use, to cut buffing grease, etc., off preparatory to plating.

A.—Blistering or peeling of an electro deposit of any description may result from several causes. Silver and gold are soft metals, therefore, if properly deposited should not blister under the influence of the burnishing tool.

1. High voltages and excess current densities with too little free cyanide in solution are the prime factors which cause such troubles.

2. Depositing silver direct upon brass without a basis deposit of nickel or a film of mercury from an immersion solution results in peeling or blistering especially if the silver solution contains an excess of free cyanide. If the silver deposits is absolutely adherent, the gold deposit will not peel or blister from it, providing in all cases the surface to which it is applied is chemically clean and free from oxidation.

3. Cleaners should be of the mild type prepared from tri-sodium phosphate, soda ash and caustic potash. A solution prepared as follows should give excellent results:

Water	1 gallon
Tri-Sodium Phosphate	3 ozs.
Soda Ash, 58 per cent	3 ozs.
Caustic Potash Flakes	1 oz.
Sodium Cyanide, 96-98 per cent	¼ to 1/3 oz.

Temp. 180° F.

If much soft soldering is applied to the instruments, unusual care must be used not to maintain the cleansing solution too hot or too strong. The tin is reduced from the solder and is held in suspension in the solution, and frequently deposits out upon the brass when the cleaning solutions are hot and strong. Often, all that is noticeable is a darkening of the brass, yet silver or any other metal will not adhere to such a surface. The results are blistered or peeled deposits.

If electro cleaners are used, an oxidized film quite frequently results upon the brass during the electro cleansing operation. To avoid this condition, a double throw switch should be connected to the supporting rod upon the cleaning tank.

The current should be used direct, first as in the plating operations for a minute or two. The articles thus become the negative factor. The current should be reversed for a moment or two so that they become the positive factor. The reversal of the current will dissolve the semi-oxidation that results from the direct cleaning operation, especially if the solution has become contaminated with the soft solder as outlined.—C. H. P., Problem 3,259.

CASTING BRONZE

Q.—We are melting bronze of the following composition, 88 copper, 11 tin, 1 zinc, 4 oz. phosphor-copper 15 per cent We are sending you a small casting cut in half for your inspection.

A.—We could not see anything wrong with the sample casting sent us from visual inspection. However, on breaking the casting, we find segregation and separation, and very rotten metal, which would indicate you are not melting your metal in the correct manner. If you are, we suggest that you see that your air and oil combustion is made so there is enough air to burn the oil. Do not run a smoky flame and have enough air to burn all the oil. If your furnace is making slag, your combustion is not right.

We suggest, also, to add 8 ozs. of the phosphor-copper when charging the turnings. Also to charge all the copper to be charged with the borings and do not start rotating the furnace until the copper is melted.

As your casting also indicates shrinkage cracks, we think your gate is light and when this grade of metal is poured, dull, shrinkage occurs. To overcome this, it will be necessary to gate your casting so the gate will set after the castings. Pour your castings at 1,950° to 2,000° F.

If you will follow these instructions, and have enough air to burn the oil, which should be 18 ozs. of air pressure and 20 to 40 lbs. oil pressure, and gate as stated above, very little trouble if any, will occur from this class of metal.

Your trouble is separation and segregation; also shrinkage. This will be overcome if the instructions are followed. We suggest that you break one of your castings to see what the trouble is. Also have physical test made now and then. However, the breaking will tell you all you need and a sample can be taken out of the furnace, poured in sand and broken after pouring.

If the metal is melted properly you will have a close, fine grain. If not, coarse crystals will appear.

If the metal shows a close, fine grain on test, your melting operation is O.K., and if you still have trouble, look to the gating of your casting.—W. J. R., Problem 3,260.

COLORING COPPER

Q.—One of our customers has bought some copper shingles, and wishes to color them before placing them on the roof. He wants the colors to be blue, yellow, red and brown. We are unable to give him any information, and would like to ask if you can tell us how this can be done.

A.—A perusal of U. S. Patent No. 1,428,170, granted September 5, 1922.—Process for Coloring Metallic Copper, will also be of help. This patent is made use of by the Anaconda Copper Company for coloring copper shingles, etc. The patent was assigned to the Anaconda company by the patentees.

A solution consisting of water, 1 gallon; hydrosulphuret of ammonium, ½ oz. Temperature 80° F. will produce red to brown tones on the cleansed copper surface.

Water, 1 gallon; hyposulphite of soda, 8 ozs.; lead acetate, 2 to 4 ozs. Temperature 180° F. will give a blue, and many other tones to copper. Greens, such as the verde greens can be produced by immersing the copper in a solution of water,

1 gallon; salammoniac, 8 ozs.; acetate of copper, 4 ozs. Cold solution. Immerse the cleansed copper in the verde green solution for a few moments, then remove; do not wash in cold water.

As the copper surface becomes dry, the green finish will result. Repeat the operations if necessary to produce a denser green coating.—C. H. P., Problem 3,261.

DEPOSITING MAGNESIUM

Q.—How can I get a deposit of magnesium?

A.—Magnesium has been deposited from the double chlorides of magnesium and ammonium magnesium chloride and ammonium chloride. It is possible that solutions prepared from magnesium sulphate, magnesium chloride and boracic acid will give a deposit of magnesium. We suggest:

Water	1 gallon
Magnesium sulphate	2 to 3 lbs.
Magnesium chloride	8 ozs.
Boracic acid	4 ozs.

Use metallic magnesium as anodes as an experiment. It is possible that carbon anodes will have to be used. The double chloride solutions can be prepared upon an equal basis of magnesium and ammonium chlorides, using 8 ozs. and upwards per gallon of water. We have no idea as to what current densities can be used. We suggest, however, a voltage of three as a basis.—C. H. P., Problem 3,262.

IMITATION GOLD ON BRASS

Q.—We are desirous of obtaining a rose gold or 14K imitation gold finish on high brass small sheet metal articles.

The idea is to obtain this stain or dip without the use of either gold chloride or the trisalyt, merely a quick non-electrolytic deposit.

We have tried a solution of copper carbonate, concentrated lye and water. It works to a certain extent, but it seems to fade out after a short time. The finish should be hard enough to stand a short ball rolling operation to bring up the color. These parts are ball rolled before the gold dip to insure getting a good surface on which to work.

A.—Probably the most satisfactory imitation gold colors are produced upon brass in a heated solution of hyposulphite of soda and lead acetate. The following basis can be tried out and the proportions increased or decreased as found desirable for the gold color wanted:

Water	1 gallon
Hyposulphite of soda	4 to 8 ozs.
Lead acetate	1 to 4 ozs.

Temp. 180° F.

If you had submitted a sample of your product to be colored a gold tone, we could possibly advise you further.

The following method is used for imitation rose gold by a shoe buckle manufacturer.

The buckles made from low brass or gilding metal are first bright acid dipped and dried out. A very thin pigment lacquer, the color of the rose gold, is applied and then when dry the buckles are tumbled in quantities.

The thin coat of pigment lacquer is removed from the surface of the buckles in the tumbling operation, and leaves the surface like gold. The rose effect remains in the background of the buckles.

After tumbling, which must be dry, the articles are lacquered. The success of the method depends upon the very thin coat of pigment lacquer first applied.—C. H. P., Problem 3,263.

METALLIZING FLOWERS

Q.—How can I get a deposit of metal on flowers, plants, etc.?

A.—The metallizing of non-metallic bodies such as flowers, plants, etc., is as follows:

1. The flowers or plants are dipped in a thin alcoholic solution of orange shellac, and then allowed to dry. All parts should be uniformly coated. Sometimes two thin coats are advisable instead of one.

2. One or more thin coats of platers' copper bronze powder, mixed with a lacquer medium should be sprayed uniformly over the surface of the plants or flowers. After the first coat, it is advisable to wire up the plants or flowers with fine copper wire, dead soft about 22 B. S. gauge. Then apply the second coat which covers wire and produces a good contact.

3. When the flowers are thoroughly dry and hard, then the plating operations may be proceeded with; the articles should be immersed in cold water to remove any non-adhering copper bronze powder. They should now be copper plated in a solution prepared as follows:

Water	1 gallon
Copper sulphate	28 ozs.
Powdered alum	1 oz.
Sulphuric acid, 66°	4 ozs.

Voltage 1. Temperature—normal. Agitation of the solution is advisable with compressed air. Anodes of soft sheet copper should be used and they should completely surround the article to be plated at a distance of 6 to 8 inches. There is a second method that is sometimes used in metallizing plants and flowers. It consists of dissolving silver nitrate in alcohol, immersing the shellaced flowers in the alcohol and nitrate of silver, and drying.

A film of silver sulphide is now formed by exposing the articles to the action of sulphurette hydrogen gas in an air-tight closed glass vessel. For this purpose iron pyrites are used immersed in dilute sulphuric acid. The copper bronze method is a successful method. It is necessary to plate the articles from 24 to 48 hours to obtain the necessary copper deposit for satisfactory results.—C. H. P., Problem 3,264.

MIXING MOLDING SAND

Q.—Under separate cover we are sending you two pieces of brass casting and a small sample of molding sand. We have been having some trouble with rough castings and our foreman is of the opinion that there is not enough bond in the sand and it therefore washes into the metal when being poured. He has been running this metal as cold as possible in order to get away from this, but we still have difficulty.

It may be some other trouble, but you may be able to tell us something from the samples we are sending you.

A.—On examination of the two pieces of brass castings submitted, we find your trouble is what is known to the trade as scabbing, and is caused by the sand being too fine, or too wet when the mold is made. The sample of sand submitted would indicate the sand is too fine and we would suggest a coarser grade be mixed with your present sand; say two parts of the sand you are using and one part of the sand, same as is used in the iron foundry. Use your sand for molding as dry as consistent, so as to get a good clean lift on the mold, as your metal contains considerable zinc. Fine or wet sand will cause the defects your castings show.—W. J. R., Problem 3,265.

MODELING WAX

Q.—Please give us a formulæ for modeling wax containing oil of sesame.

A.—Modeling waxes prepared with oil of sesame should be made up as follows:

Summer modeling wax:

White wax	20 parts by weight
Ordinary turpentine	4 parts
Oil of Sesame	1 part

Red, vermilion or any dry color, such as chrome greens—2 parts.

Winter wax:

White wax	20 parts by weight
Ordinary turpentine	6 parts
Oil of Sesame	2 parts

Red, vermilion, etc., as outlined—2 parts.

The waxes should be mixed and worked up to the consistency of thick window putty.—C. H. P., Problem 3,266.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,492,685. May 6, 1924. **Refractory Lining for Metallurgical Purposes.** Edwin W. Hale, Greenwich, Conn.

As an article of manufacture, a container for molten metals and other materials, the portions of the lining of which container most liable to be exposed to the destructive action of the molten materials and gases are faced with bricks made of an alloy containing chromium.

1,492,698. May 6, 1924. **Polishing Composition.** James M. Owen, Emerson, Ark.

The herein described polishing composition consisting of 12 gallons of gasoline, 4½ gallons of varnish, 4 pints of turpentine, and 1 gallon of castor oil.

1,492,912. May 6, 1924. **Molding Machine.** F. J. Wood, Des Moines, Iowa.

In a molding machine, a main frame, a pattern frame mounted on said main frame, a mold table, an air actuated device and means operated by said air actuated device for imparting an accelerated movement to said mold table to move it to or from said platform.

1,493,012. May 6, 1924. **Rustproofing Process and Compound.** Charles E. Abraham, Detroit, Mich.

A rust-proofing composition containing the following substances; barium nitrate, zinc oxide, antimony trioxide, oxalic acid, phosphoric acid, water.

1,493,035. May 6, 1924. **Soldering Machine.** Charles Gueritey, Passaic, N. J., assignor to Passaic Metal Ware Company, Passaic, N. J.

A soldering machine comprising means to propel articles to be soldered, a reciprocative member, soldering devices carried by said member, and means to move the member and the soldering devices from an initial position in the direction of movement of and with the first named means for soldering said articles and to move the member and the soldering devices reversely to said initial position at a greater speed than the propelling means.

1,493,118. May 6, 1924. **Lock for Foundry Flasks.** George F. Loughran, Boston, Mass., assignor of one-half to F. C. Langenberg, Cambridge, Mass.

In a molder's flask, the combination with the four sides and corners, of a hinged connection at one corner, and a lock at the diagonally opposite corner, said lock comprising lug members secured to adjacent sides of said flash respectively, and a vertically slidable bolt movable to engage and disengage both of said lug members.

1,493,692. May 13, 1924. **Dental Casting Machine.** Thomas A. Nixon, Atlanta, Ga.

In casting apparatus, a movable hollow carrier adapted to be connected with a source of fluid under pressure, a perforated flask cover having a communication with the interior of said carrier, a universal joint between said carrier and said cover, and a valve for controlling the flow of fluid under pressure to said cover.

1,493,754. May 13, 1924. **Rock-Over Molding Machine.** Wm. P. Krause, Chicago, Ill., assignor to Hanna Engineering Works, Chicago, Ill.

In apparatus of the class described, rotatable arms, pulleys operatively attached thereto, a pair of cylinders, pistons reciprocally mounted in said cylinders, each of said pistons being operatively attached to one of said pulleys, said pistons and pulleys being so arranged that the pull of one of said pistons upon its pulley will be opposed to the other of said pistons upon its pulley.

1,494,103. May 13, 1924. **Process for Die Casting.** Otto De Cardy, Chicago, Ill.

A process of die casting which consists in arranging an inset of a non-metallic substance in a mold design to form a frame having fixed engagement with said non-metallic substance, then pouring molten metal into said mold at a temperature which will soften that portion of the non-metallic substance contacting with the molten metal and weld the meeting faces thereof together to form a permanent union between the non-metallic substance and the metal.

1,494,152. May 13, 1924. **Continuous Automatic Process for the Production of Metal Sheets, Wire, Tubes, Cylinders, and Other Articles.** Sherard Osborn Cowper-Coles, Sunbury-on-Thames, England.

An electrolytic process for the production of metal sheets, wires, tubes, cylinders and other articles wherein the cathode has imparted to it an oscillating or reciprocating motion in the electrolyte of a rapidity or frequency sufficient to throw off or disperse the denuded cathodic film.

1,494,254. May 13, 1924. **Alloy.** Edward Kiam, New York, and M. G. Collins, Scarsdale, N. Y.

An alloy comprising magnesium, platinum, gold and nickel, in proportional parts increasing in the aforesaid order of the aforesaid ingredients, the content of nickel being largely predominant.

1,494,393. May 20, 1924. **Method of Making Alloys.** Richard Walter, Dusseldorf, Germany.

The process of alloying silicon with metals of high melting point, which consists in heating a mixture of said components to a temperature at which exothermic reaction is initiated, and in then using this reaction to melt down the charge and complete the process.

1,494,409. May 20, 1924. **Method of Producing Copper Trolley Wheels.** Wm. S. Bidle, Cleveland, Ohio, assignor to the Copper Products Forging Company, Cleveland, Ohio.

A method of grooving a wheel, consisting in parting a metal blank, annularly to provide a groove and flaring side flanges, and in flowing the metal involved in the surfaces of said groove and flanges upon itself under spreading pressure to harden such grooved surfaces.

1,494,410. May 20, 1024. **Method of Making Trolley Wheels.** Wm. S. Bidle, Cleveland, Ohio, assignor to the Copper Products Forging Company, Cleveland, Ohio.

A method of making a trolley wheel, consisting in forming a deep circumferential groove in a round body of ductile metal of high electrical conductivity, in working the material in the opposite faces of the groove into confluence at the bottom of the groove, and in removing the surplus confluent stock.

1,494,411. May 20, 1924. **Trolley-Wheel Blank and Method of Making Same.** Wm. S. Bidle, Cleveland, Ohio, assignor to the Copper Products Forging Company, Cleveland, Ohio.

A trolley wheel blank made of ductile metal comprising a disk-shaped body with central hubs and annular enlargements adjacent said hubs.

1,495,090. May 20, 1924. **Molding Machine.** Wilfred Lewis, Haverford, Pa., asisgnor to the Tabor Manufacturing Company, Philadelphia, Pa.

In a molding machine the combination of a piston and cylinder operative to make its stroke in two movements with a dwell between them, a second piston and cylinder operative during the dwell, valve locking gear responsive to the movement of a sliding frame and operative to compel the operation of said pistons and cylinders in the order named, a sliding frame having roll-over arms, connections for causing the first mentioned piston and cylinder in each of its movements to lift the frame and arms, and connections for causing the second mentioned piston and cylinder to roll the arms over.

1,495,175. May 27, 1924. **Apparatus for Heat Treating Metal-Coated Materials.** Joseph L. Herman, Peoria, Ill.

An apparatus for heat-treating metal coated materials before the coating has set, comprising an open ended single heat-treating unit arranged to heat-treat the material by radiation, and other means for applying heat directly to the material.

1,495,487. May 27, 1924. **Method of Coating.** John Bertrand Johnson, Elmhurst, N. Y., assignor to Western Electric Company, New York, N. Y.

The method of coating a vessel which comprises applying an adhesive to the inner wall of the vessel to be coated, introducing into the vessel a finely powdered material in the form of a cloud, and allowing such material to settle on the adhesive.

1,495,632. May 27, 1924. **Process for Enameling of Metals, Wires and Metal Structures.** Louis De Raphelis-Soissan, Marseilles, France.

In a process for the manufacture of insulated enameled electric wires, in which the wire is to be insulated by enameling, first coating the wire with a ground stratum of a flexible porous substance, subsequently applying a stratum of powdered enamel, setting the wire in the proper shape, and finally heating to the degree necessary to melt the powdered enamel constituting the insulating coating resting upon the base or ground stratum.

1,495,961. May 27, 1924. **Process for the Production of Metal Powder or Dust.** Minton H. Newell, Palo Alto, and Evald Anderson, Alhambra, Calif., assignors to International Precipitation Company, Los Angeles, Calif.

The process for producing metal dust or powder which consists in producing the vapor of the metal by action of heat heat on material containing such metal, bringing such vapor into contact with a gaseous medium which is at a sufficiently low temperature to cause condensation of the zinc vapor, such gaseous medium being capable of producing sufficient oxidation of the metal to insure condensation into finely divided solid particles.

1,496,125. June 3, 1924. **Drawbench for Metal Tubing.** David C. Larson, Yonkers, N. Y., assignor to Sundh Engineering & Machine Company, Philadelphia, Pa.

In a draw bench having a die for drawing metal tubing, the combination of the drawing mechanism, an electric motor to actuate the drawing mechanism to draw a tube and return the drawing mechanism to the die, and resistance, adapted to be inserted in the circuit of the field winding of the motor, whereby the speed of the drawing mechanism in returning to the die is higher than its speed in drawing a tube.

1,496,137. June 3, 1924. **Drawbench Apparatus.** August Sundh, Hastings-on-Hudson, N. Y., assignor to Sundh Engineering & Machine Company, Philadelphia, Pa.

In an apparatus for drawing metal tubes having a stationary tube drawing die and traveling tube drawing mechanism, adapted to travel from and to the die, a spring adapted to cushion the drawing mechanism against the die in its return travel thereto.

1,496,269. June 3, 1924. **Alloy.** Ityro Iytaka, Tokyo, Japan, assignor to Mitsubishi Zosen Kaisha, Ltd., Tokyo, Japan.

An alloy consisting essentially of 74 to 97% of copper, 2 to 11% of aluminum, 1 to 15% of nickel.

1,496,309. June 3, 1924. **Process and Apparatus for Coating Metal Articles.** Harvey F. Girvin, Ansonia, Conn.

A method of applying a metallic coating which comprises, passing a surface to be coated in contact with a portion separated from a body of molten metal out of contact with the air, said surface preventing a contact of the molten metal with the air.

1,496,505. June 3, 1924. **Enameled Ware.** Harold F. Whittaker, Carneys Point, N. J., and T. Baker, Wilmington, Del., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del.

As a new article of manufacture, an enameled iron alloy comprising an enamel whose components are present in the following proportions:

	Per Cent
SiO_2	67.0 to 75.0
B_2O_3	4.0 to 24.0
Na_2O	4.0 to 8.5
K_2O	0.2 to 1.3
CaO	0.2 to 7.0
MgO	0.0 to 0.5
Al_2O_3	0.0 to 10.0
PbO	0.0 to 1.0

and an alloy having substantially the same coefficient of expansion as said enamel and containing between 50 and 68% of iron and between 43 and 32% of nickel.

1,496,506. June 3, 1924. **Rust and Grease Remover.** Glen Lenardo Williams, Detroit, Mich., assignor to Randall Williams Company, Detroit, Mich.

A rust remover comprising a solution resulting from the mixture of a salt of an alkali metal, a mineral acid, an alcoholic ester, borate of manganese and molasses.

1,496,809. June 10, 1924. **Thrust Bearing and Method of Making Same.** Carl W. Johnson, Cleveland, Ohio, assignor to the Cleveland Graphite Bronze Company, Cleveland, Ohio.

A thrust bearing comprising a thin metallic plate provided with a series of regularly arranged recesses in one face, and a second series of recesses in the opposite face, said second series of recesses being of a different pattern than said first series, and said recesses in the opposite faces being staggered with relation to one another so that no recesses in one series are directly opposed to the recesses in the other series.

1,496,838. June 10, 1924. **Testing Machine.** B. C. Batcheller, Brooklyn, N. Y., assignor to Bemis Bro. Bag Company, Boston, Mass.

In a machine for testing the strength of sheet material, the combination of parts for holding a strip of material to be tested in the form of a loop, said strip being of substantial width, mechanism for relatively moving said parts to tension said loop, said parts being constructed to exert a substantially uniform tension across the entire width of said strip, and means for indicating the intensity of the force applied to said strip.

1,496,845. June 10, 1924. **Process of Producing Pure Chromium by Electrolysis.** George Grube, Stuttgart, Germany, assignor to Metal & Thermit Corporation, Chrome, N. J.

Process of producing pure metallic chromium which consists in electrolyzing a solution formed by mixing water, chromium trioxid, chromic hydroxid, and an acid other than chromic acid capable of forming a soluble chromium salt by reaction with chromic hydroxid, the chromium trioxid being equal to at least twice the total amount of the chromic hydroxid and acid.

1,497,011. June 10, 1924. **Method of Treating Metals.** Gustav F. Gerdts, Bremen, Germany.

The herein described method of adapting low grade metal to desired uses, which consists in adding to the molten metal for each given unit of weight thereof a metal addition body which, when it melts, indicates the correct pouring temperature of the molten metal.

1,497,265. June 10, 1924. **Zinc-Electroplated Articles.** Joseph Haas, Jr., Muncie, Inc., assignor to the Roessler & Hasslacher Chemical Company, New York, N. Y.

As a new article of manufacture, a ferrous article coated with a dense bright electrolytic coating comprising zinc alloyed with mercury.

1,498,073. June 17, 1924. **Method of and Apparatus for Testing Platinum Alloys.** Adolph Cohn, New York, N. Y.

The method of testing platinum alloys which consists in scratching marks on a flat stone with the alloy to be tested and with an alloy of known composition or with pure platinum, covering the marks with a platinum dissolving liquid and comparing the rate of speed of the action of the liquid on the marks.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

New Motor Driven Polishing Lathe

By R. C. MITCHELL,
President of the Mitchell Engineering Company, Springfield, Ohio

Illustrations herewith show the development of a new motor driven polishing lathe unit.

In view of the fact that all alternating current motors operate at fixed and unalterable speeds, which speeds are generally not the most efficient for a majority of polishing and buffing operations, the Mitchell Engineering Company, were prompted to bring out this new type of motor driven machine.

Where the motor shaft or spindle is simply extended to carry the wheels, the only spindle or wheel speed obtainable with 60 cycle frequency is either 1,800 or 3,600 r.p.m. With 25 cycle frequency the only speed obtainable is 1,400 r.p.m. The speed of 1,800 is too slow for practically any kind of polishing, while 1,400 is entirely out of the question. Then for buffing and coloring, the lower speeds are not at all available, while the work on which a speed of 3,600 would be available is practically negligible.

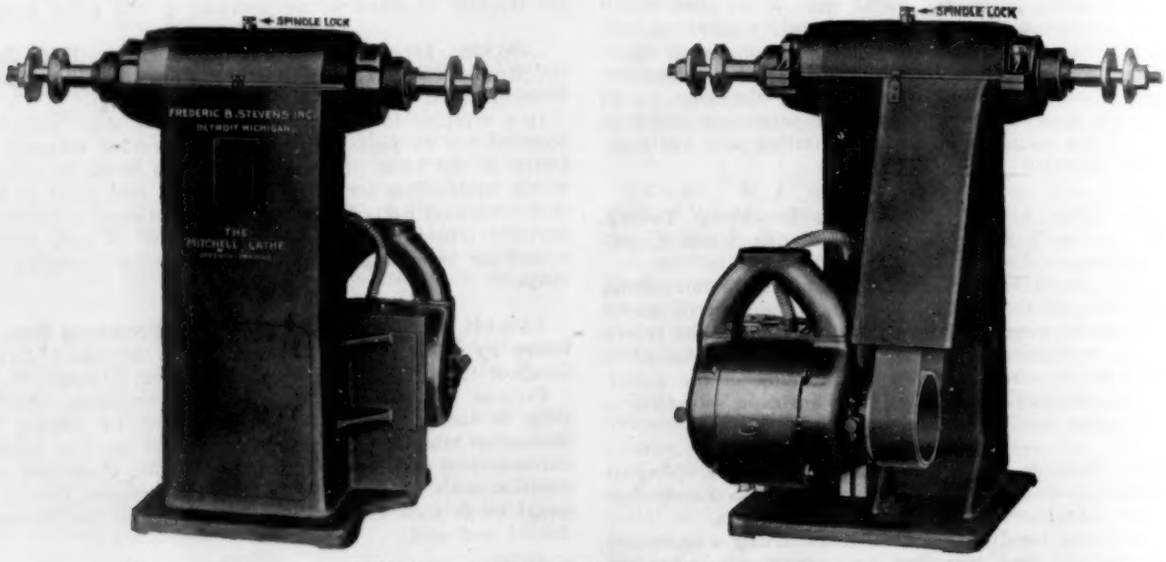
Clean cool air is supplied to the motor through the "Y" inlet at top of motor (see cut). The suction fans, one on each end of rotor, give enough suction to draw the air for a distance of 75 feet insuring a clean cool motor at all times.

The method of mounting the motor on the lathe is very simple. The adjustable base is bolted to the frame of machine in a vertical position so that the motor can readily be lowered to keep the belt perfectly taut.

The belt is carefully guarded as indicated in illustration. Pulley cover is hinged so that every part is readily accessible, and is provided with a locking pin to hold spindle from rotating while changing wheels.

Machine is provided with a magnetic starting switch with push button control—a button to start and another to stop. It is all complete ready to attach to line wires anywhere and place in operation.

The machine is built by The Mitchell Engineering Company,



TWO VIEWS OF MITCHELL POLISHING LATHE

With this machine any desired spindle or wheel speed may be obtained with any frequency alternating current motor by changing the ratio of motor and spindle pulleys. For instance, the machine illustrated is provided with a 60 cycle alternating current motor with a speed of 1,800 r.p.m.—the motor pulley is 8" diameter and the spindle pulley 6" diameter, delivering a spindle or wheel speed of approximately 2,300 r.p.m.

The lathe proper is the standard construction of Mitchell lathe, using a double bearing housing of the ball and socket type for supporting each end of spindle, insuring an equal distribution of the load on all four bearings.

The lathe is furnished with a ball bearing, fully enclosed, self-ventilated type alternating current motor, either 60, 50 or 25 cycle.

Special attention is directed to this type of motor. It is completely enclosed and gives positive protection of the motor against dust, gas, oil or water which soon wrecks the ordinary type motor. The flash from the momentary overload is confined within the motor housing, thus eliminating all fire hazard from dust explosions.

of Springfield, Ohio, who have patents pending on their construction. It is being marketed by Frederic B. Stevens, Inc., of Detroit, Mich.

NEW ZINCING PROCESS

The Classen process for the production of glossy metals, patented in the United States, is an invention for the electroplating industry. This process is said to produce metal coatings of great beauty and extraordinary adherence. The process especially relates to the zincing of iron and is also said to be in use by large companies in Germany, France, Belgium and Luxembourg.

Since the beginning of zincing many inventors have occupied themselves with the covering of iron by zinc. Nevertheless, all these methods produced only a zinc coating of grey color which is comparatively porous, so that the zinc deposit must be very thick really to prevent the oxidation of the iron. Different from all the methods known until now, the Classen

process can, it is claimed, be used to cover iron of all forms: nails, screws, sheet, tube and wire in short time with a bright, white and glossy zinc deposit, which is extremely dense. Under the microscope deposits produced by the old and the new process are said to be very different. Enlarged even five hundred times the surface of the Classen deposit is smooth, while the former has an irregular structure, full of holes.

Since all arrangements for the zincing are like those of the old process, the Classen process claims great advantages; in the first place, saving if zinc. Sheets zinced by the new process have 10-75 grams of zinc per square meter against 125-150 grams of zinc under the old methods. Also the exterior of the new coating is altogether different from the old, resembling, it is claimed, nickel, silver or tin. Therefore, the applicability of the new process is considerably greater than hitherto. Zinced iron may replace tin plate.

The Classen process is controlled by Alexander Classen, Aachen, Germany.

AIR-TIGHT BLAST GATE

The W. S. Rockwell Company, 50 Church street, New York, is putting out an air-tight blast gate for use with low pressure air systems. The Rockwell air-tight blast gate is very low in first cost, quick and convenient in operation, and has no costly parts to replace, such as stem and gate. It is

ROCKWELL BLAST GATE FLANGED CONNECTION

claimed that by virtue of its design, this inexpensive blast gate does not clog when used in such difficult operations as the control of powdered coal, paint, dry color, starch, etc.

If a valve has a restricted opening, a bigger, more expensive one is needed to get the same amount of flow as from a Rockwell air-tight blast gate. This blast gate, which affords the full area of the line, will do the work of a larger gate valve at considerably less cost.

CONSTRUCTION

An iron casing made in two parts and bolted together; a non-rusting, hard-rolled brass slide completely housed in; a handle passing through a stuffing box—these are the parts forming Rockwell air-tight blast gate.

The slide moves in a machined runway, with just enough clearance to permit movement. The face of each half of the casing is also machined and this forms an air-tight joint. The handle attached to the slide extends outside the casing through a stuffing box. The casting is held together with finished machine bolts and may be readily taken apart. Each blast gate is tested before shipment.

SPECIAL CONSTRUCTION

When desired, this blast gate, or its various parts, can be made of special metals to meet individual manufacturing requirements.

The Rockwell Company can furnish blast gates with monel

ROCKWELL BLAST GATES THREADED CONNECTIONS

metal slides and handles; entire gate of monel metal; with steel slides; entire gate of brass; also bronze, etc.

This blast gate can also be furnished with lever operating mechanism, with pulley and chain, and with rack and pinion.

NEW METAL CUTTING TORCH

An advance in the art of oxy-acetylene cutting apparatus has been recently announced by the Alexander Milburn Company, Baltimore, Md. This is the perfection of a tip for cutting, which, while embodying all the desirable features of the standard tip, has, it is claimed, additional features which mark it as a signal improvement.

The distinctive features of this tip are a method of "super-mixing" the gases and preheating the cutting oxygen as well as giving added velocity and penetration to the preheating and cutting jets. A further feature is that the tip is provided with a renewable seat at a fraction of the cost of a complete tip, rendering it unnecessary to re-machine or discard the used tips. This renewable seat facilitates the cleaning and maintenance of the tip. In the standard tip the seat could be refaced by taking a thin cut off of it in a high speed lathe, but if the lathe is not available the seat cannot as readily be refaced.

The new tip is said to retain all the advantages of the tip which has been standard on Milburn torches for a number of years, with the added advantages noted above. The mixture of the preheating gases takes place in multiple passages in the renewable seat. These gases then pass into an annular passage where they are given a swirling motion and an additional mixing. The gases are again separated and expanded into enlarged multiple passages leading to the orifices in the tip proper. Here the preheating flames are projected with an increased velocity inclined toward the high pressure oxygen jet resulting, according to the manufacturers, in a speedier cut, a narrower kerf and a material saving in gases.

As a result of cutting tests which have been conducted the following economies in the use of this tip over standard tips have been claimed: Time, 17.5 per cent; oxygen, 10.9 per cent; acetylene, 25.0 per cent; totaling a saving of approximately 18 per cent in the cost of operation.

This "Super-Tip" with renewable seat, is interchangeable with all sizes of Milburn cutting tips and will fit all this company's torches manufactured since 1916.

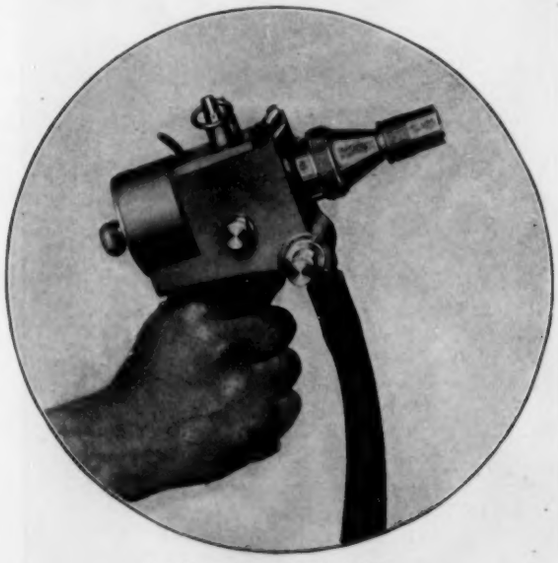
SCHOOP PROCESS DEVELOPMENTS

The Schoop metal coating process has been developed and widened so that, at the present time, it covers several types of equipment. These types are as follows:

1. The "Metalayer" which uses metal in wire form of the standard commercial gauges and with which coatings of copper, brass, bronze, nickel-silver, aluminum, zinc, lead, tin, iron, nickel, Monel metal and various alloys of these metals can be sprayed.
2. The "Gravitas" which uses metal in the form of dust and with which zinc, aluminum, tin and lead are usually handled.
3. The Mass Coating Machine, a combination of either one of the above, with a specially constructed rumbling barrel and with which articles weighing from a fraction of an ounce up to 10 lbs. each may be treated in lots of approximately 100 lbs.

"METALAYER"

The "Metalayer" weighs about 3½ lbs. and is connected to standard acetylene and oxygen cylinders and a supply of compressed air. It is said to consume, while in use, 15 cu. ft. each of the gases per hour and 50 cu. ft. per minute at 50 lbs.



SCHOOP METALAYER

pressure of the air. Metal in the form of standard gauge wire is automatically pulled from a reel into the rear of the gear case and fed uniformly and continuously at a rate of from 12 to 24 feet per minute to the muzzle of the short barrel, where it enters into a continuous reducing flame zone developed from the gases and air, and is there melted and blown in a fine spray onto the surface to be coated.

The wire remains cold and unaltered until it emerges from the muzzle at a point about 3/32 of an inch from which it is melted and undergoes transformation into spray. It is also stated that the temperature of the surface being coated is raised but slightly, the evidence of which is the fact that heads of lucifer matches may be coated with molten metal without being ignited, sticks of smokeless powder have been treated and thin paper, fabrics and wood have been coated without charring.

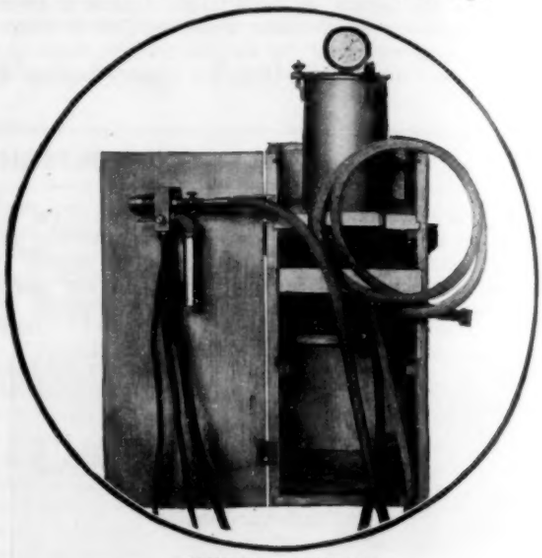
"GRAVITAS"

The Gravitas consists of a cylindrical container which holds about 20 lbs. of the powdered metal. At the top is fitted a removable cover to which is attached a pressure gauge, and at the bottom of the container is placed a dust distributor. From the distributor the metal dust passes through a rubber tube to the spraying tool or gun, which passes it between two concentric flame zones at the muzzle, where it is heated to a plastic state and blown onto the surface to be coated.

MASS COATING MACHINE

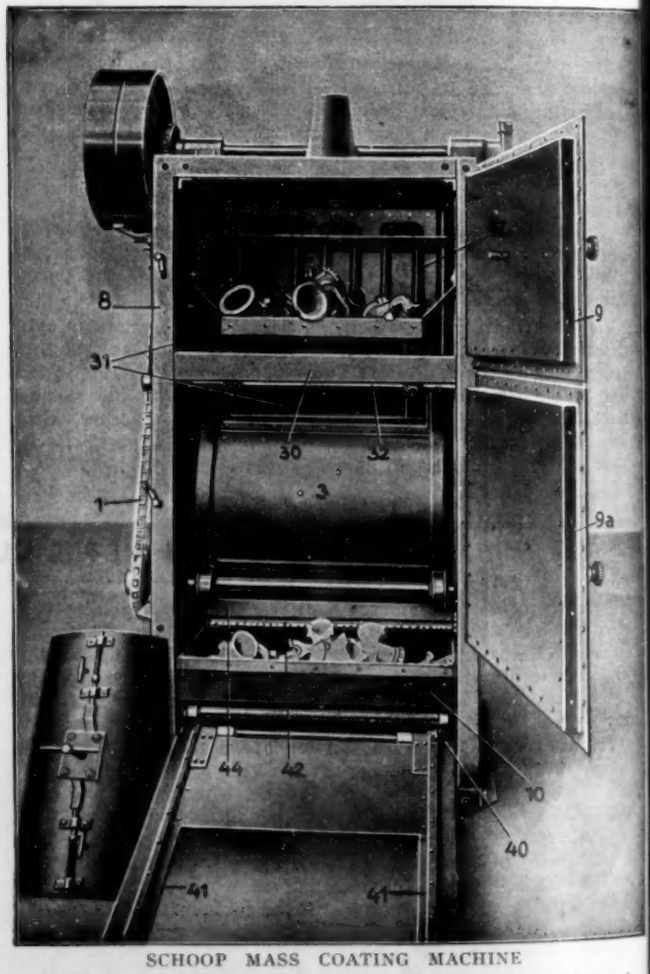
The Mass Coating Machine consists of a rumbling barrel, pre-heating coils, upper and lower trays and rails on which the lower tray runs out with the finished pieces. These parts are enclosed in a box container. The pre-heating tray is operated by a lever and gas supplied by Bunsen burners for raising the interior temperature to the required degree. The coating of the work in this machine is done by two Metalayers.

The machine is 4′ 4″ long, 6′ wide and 6′ 6″ high.



SCHOOP GRAVITAS

The manufacturers state that with this equipment, small parts in quantities of 100 lbs. at a time can be coated with any metals in from 8 to 30 minutes; that threaded parts do not require re-



SCHOOP MASS COATING MACHINE

threading; that interiors of fittings are reached by the coating, and if desired the parts may be ball polished or rumbled in leather scrap or sawdust for finishing.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

Headquarters, 140 S. Dearborn Street, Chicago, Ill.

The nominating committee of the American Foundrymen's Association for the year 1924, consisting of Past Presidents C. S. Koch, chairman, W. R. Bean, and C. R. Messinger; A. H. Jameson, Jesse L. Jones, Warren G. Jones, and S. W. Utley, elected by mail ballot of the members, have unanimously nominated the following as officers and directors of the association:

For President to serve for one year:

L. W. Olson, Works Manager, Ohio Brass Co., Mansfield, Ohio.

For Vice-president to serve for one year:

A. B. Root, Jr., Mechanical Engineer, Hunt-Spiller Manufacturing Corporation, Boston, Mass.

For Director to serve for one year:

V. E. Minich, President, American Foundry Equipment Co., New York City.

For Directors to serve three year terms each:

G. H. Clamer, Vice-president and General Manager, Ajax Metal Co., Philadelphia, Pa.

John E. Galvin, President, Ohio Steel Foundry Co., Lima, Ohio.

A. E. Hageboeck, Secretary, Frank Foundries Corp., Moline, Ill.

R. A. Nourse, Vice-president and General Manager, Stowell Co., South Milwaukee, Wis.

Wm. J. Nugent, Vice-president and General Manager, Nugent Steel Casting Co., Chicago.

AMERICAN ELECTRO-PLATERS' SOCIETY

NEW YORK BRANCH

Headquarters, Care of John E. Sterling, 468 Grand Ave., Long Island City, N. Y.

President Fischer presided at the June meetings of the New York Branch of the A. E. S.; attendance was exceptionally good. E. B. Davidson was elcted to associate membership. B. Cross was reinstated. J. Dobin and G. Gorman were elected to active membership. A resolution was presented and adopted, a letter of condolence be sent to the family of our late member, D. Schoonmaker, one of our oldest members, who was very active in promoting the principles of the A. E. S.

The treasurer's annual report proved the New York Branch financially sound. Past President T. B. Haddow complimented the retiring officers on the excellent service they rendered branch, then proceed with the installation ceremonies of the newly elected officers who are as follows: President, William Fischer; vice-president, Fred Haushalter; secretary-treasurer, John E. Sterling; recording secretary, Stanley Schubert; assistant sergeant-at-arms, James Eagan; trustees, Thomas B. Haddow, Arthur Havens, Elias Schorr.

An interesting discussion on the causes of redstains on bronze castings, and light gray coatings on brass anodes was held, after which business was suspended in honor of the newly installed officers. Refreshments were served, and a jolly evening was enjoyed.

Meetings of branch are adjourned until September 12, 1924.

ST. LOUIS BRANCH

Headquarters, Care of E. J. Musick, 7144 Kingsbury Boulevard

The headquarters of the St. Louis Branch have been moved to 7144 Kingsbury Boulevard, St. Louis, Mo.

MUSEUM OF ENGINEERING AND INDUSTRY

Headquarters, 29 West 39th Street, New York City

One million dollars has been assured towards the establishment of the National Museum of Engineering and Industry, Incorporated, with headquarters in the Engineering Societies Building, New York. A campaign to raise an additional nine million dollars starts today. The president of the new organization is Dr. Elihu Thomson, who today receives the Kelvin Gold Medal from the Royal Society at the Kelvin Centenary in London. The vice-presidents are Dr. Edward G. Acheson, one of the creators of the modern abrasive industry; Dr. Leo H. Baekeland, inventor of Velox paper and Bakelite (he is president of the American Chemical Society), and Dr. Edward Weston, creator of the Weston type of electrical instruments. Its trustees are Philip T. Dodge, chairman of the International Paper Company; Howard Elliott, chairman of the Northern Pacific Railroad; Dr. Ira N. Hollis, president of the Worcester Polytechnic Institute; Dr. Elmer A. Sperry, president of the Sperry Gyroscope Company, and Worcester R. Warner, of Warner & Swasey, Cleveland, Ohio, makers of the great telescopes of the world. George E. Roberts, vice-president of the National City Bank, is treasurer, and H. F. J. Porter, industrial engineer, is secretary.

In co-operation with the Smithsonian Institution the new organization is planning to erect on its grounds in Washington a building to house the original models of early inventions and the records of constructive achievement of pioneers, inventors and engineers in the development of transportation and industry. In this way the United States will be given the kind of institution which all the great European nations have possessed for years, and in the layout of the proposed museum use will be made of the data collected by an expert who has recently returned from a year's survey of museum practice abroad.

An important departure in the American scheme is proposed however, made necessary by the vastness of the country. In addition to the central collection at Washington, special collections such as replicas of the historical exhibits will be carried to the people, also live machinery of modern processes will be placed in affiliated museums in industrial centers of every state. Already old models and records long forgotten have been located and resurrected and this winter will be exhibited at the headquarters as a demonstration of how the ultimate collection will appear.

EXPOSITIONS OF INVENTIONS

Headquarters, 47 W. 34th Street, New York

Manufacturers in every American industry will be interested in the Exposition of Inventions to be held, December 8th to 13th inclusive, 1924, in the famous Engineering Societies Building, New York City. The American Institute of the City of New York is handling this display through its Inventors' Section, with behind it an experience of ninety-six years in fostering and portraying American industrial life.

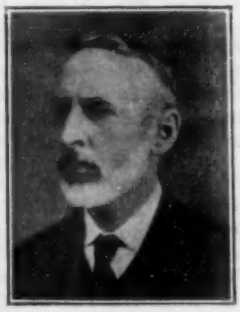
In this display of American inventions the American Institute will be continuing with a new emphasis almost a century's encouragement of inventors and introduction of their works to the public. Among inventions now used throughout the world that were first displayed to the public at earlier All-American fairs of the Institute are the Morse telegraph, the Hoe lightning printing press, the McCormick reaper, the Howe sewing machine, the Bell telephone, the Colt revolver, the Francis metallic life boat, and many others.

Arrangements for the display of working models or actual devices at the Exposition of Inventions can be arranged through a Committee of the American Institute at 47 West 34th street, New York City. All proposed displays are subject to approval by the institute, it being the desire to show only those things of sound worth.

Personals

PROFESSOR THOMAS TURNER

The recent election of Professor Thomas Turner as president of the British Institute of Metals greatly gratified the members of the metal trades and the public generally in the Birmingham district. Born in Birmingham in 1861, Mr. Turner showed at an early age an interest in chemical and other scientific studies. From the Birmingham & Midland Institute he obtained in 1878 a scholarship at the Royal College of Science and School of Mines, London. After taking further honors in London he returned to Birmingham in 1882 as demonstrator in chemistry under Professor Tilden at the Mason College. The college was founded by Sir Josiah Mason, a wealthy pen manufacturer. It became afterwards the Birmingham University College and ultimately the nucleus of the University of Birmingham. After eight years spent as director of education to the Staffordshire County Council, Mr. Turner in 1902 returned to Birmingham as professor of metallurgy in the university, in the establishment of which he had taken an active part.



PROFESSOR THOMAS TURNER

He has been a prolific contributor to scientific literature and is the author of a number of metallurgical text-books. His early researches in cast-iron became the foundation upon which much of the recent knowledge of the subject has been built. Among the subjects of his recent contributions have been The Hardness of Metals, The Transparency of Thin Films of Metal, The Volume Changes of Brass, The Nature and Constitution of Slags, Malleable Cast Iron and Volatility of Metals, and Gases in Metals. A notable characteristic of Professor Turner has been his ability to inspire others with his interest in scientific investigation. At the Birmingham University he has always had round him a body of earnest research students many of whom have achieved independent fame.

He is a fellow of the Institute of Chemistry and a member of most of the leading British technical and scientific bodies and has held appointments on important national and international research and standards committees. He was treasurer of the Institute of Metals for some years and has served on its Corrosion Committee. The Institute of British Foundrymen, in the establishment of which he took part, has had him as president. So has the Staffordshire Iron & Steel Institute, which claims to be the oldest body of its kind. He was for some time chairman of the Birmingham Local Section of the Institute of Metals, and at the last meeting of the Section a resolution congratulating him on his accession to the presidency of the Institute was passed.—G.

Elmer W. Woodmansee, who is well known to readers of THE METAL INDUSTRY as an author, has been appointed representative of the Allied Industrial Products Company of Chicago, Ill. Mr. Woodmansee will cover Michigan and the contiguous territory.

R. P. Brown, president of the **Brown Instrument Company,** Philadelphia, Pa., manufacturers of pyrometers and indicating and recording instruments, announces the appointment of **R. D. Bean** as the company's chief engineer.

Deaths

WILLIAM W. SMITH

William W. Smith, president of John Hassall, Inc., wire nail manufacturers, died at Brattleboro, Vt., on June 24, 1924, following an operation for appendicitis. He was 58 years of age. He was returning from Hanover, N. H., where he had attended the graduation of his son William from Dartmouth when he was stricken with the illness which resulted fatally. Funeral services were held from his home, 236 Barclay street, Flushing, N. Y., and he was buried in the Flushing cemetery.

Mr. Smith had been associated with the firm of John Hassall, Inc., for the last 42 years. He was born in Philadelphia, February 22, 1866, and came to New York to enter the wire nail business at the age of sixteen. His initial salary was fifty cents a week and board; his hours, from dawn to dusk. The wire nail industry was at that time little more than an infant, but it was able to stand alone and it grew rapidly. The firm of John Hassall, Inc., kept pace, not by quantity production but by specialization. Mr. Smith literally grew up with the business.

Under the tutelage of his uncle, whose name the firm bears and by close personal contact with every angle of the business he learned the intricasies of nail making from wire to finished product. When Mr. Hassall retired from active participation, Mr. Smith became managing director. He was subsequently elected president.

During his regime the business expanded, enjoying a steady and healthy growth. The production of nails, rivets and escutcheon pins was greatly increased and, in addition, electro-plating and screw departments were installed. Today these departments are a vital part of the business.

Mr. Smith is survived by a widow and three sons, Theodore, a graduate of Rensellaer Polytechnic Institute, now president of the firm; Harvey, a graduate of Princeton, and William, a graduate of Dartmouth. His brother, Joseph, is superintendent of production.

S. OLIN JOHNSON

S. Olin Johnson, president of the Penberthy Injector Company, Detroit, Mich., died Saturday, May 17, in a sanitarium at Los Angeles, Cal., in his 77th year. At the time of his death his two sons, Homer S. Johnson and Charles B. Johnson, treasurer of the Penberthy Injector Company, were with him. The funeral was held Saturday, May 24.

Mr. Johnson was one of the founders of the Penberthy Injector Company, and of the Detroit Employers' Association. For more than forty years, thirty of which he was president of the Penberthy Injector Company, he was a prominent figure in Detroit industrial and business circles. Born in Westfield, Mass., June 15, 1847, Mr. Johnson entered the counting room of a New York tobacco manufacturer at the age of 18. He was offered an executive position and an interest in a toy manufacturing firm in 1871 and continued with that firm until 1877, when ill health forced him to go to Denver. In 1884 he located in Detroit as manager of a knitting company and two years later became associated with Homer Pennock and William Penberthy in the organization of the Penberthy Injector Company. Mr. Johnson was instrumental in 1902, in causing an amalgamation of the Brass Manufacturers' Association and the Metal Manufacturers' Association under the name of Detroit Employers' Association, of which he was first vice-president. He was a member of many clubs and organizations, among them being the Board of Commerce, the Detroit Club, the Country Club, the D. A. C., the Old Club, the Au Sable Fishing Club, Michigan Sovereign Consistory, Essex Golf and Country Club, the Detroit Golf Club.

His wife, whom he married in 1873, died seven years ago. She was for many years a leader in Detroit musical circles. He leaves four children, Homer S. Johnson, Charles B. Johnson, Mrs. Kenneth Macbeth, of Monclair, N. J., and Mrs. Elmore Staples, of Wycliffe, B. C.

GEORGE EDWARDS JUDD

George Edwards Judd, 66 years of age, president and treasurer of the **Mattatuck Manufacturing Company**, of Waterbury, Conn., died at the Waterbury Hospital, July 7, 1924, after an illness of four weeks. He was also treasurer of the West Side Savings Bank, treasurer of the City Sinking Fund, and head of the real estate and insurance firm of Judd & Puffer.

He was born in New Haven, December 1, 1857, and came to Waterbury at an early age. He was reared in modest surroundings and achieved his place in the community unaided. He first entered the employ of the Burcey Chemical Company and for a time was associated with the Naugatuck Railroad. In 1877 he entered the employ of the Waterbury National Bank as a teller and in 1910 became treasurer of the West Side Savings Bank. In 1880 he established the real estate and insurance firm of Judd & Puffer. He founded the Mattatuck Manufacturing Company, taking great pride in its growth and prosperity, and for years was its president and treasurer.

He was a member of the Second Congregational Church, an Odd Fellow and a member of the Waterbury Club and the Country Club. —W. R. B.

PATRICK POWERS

Patrick Powers died at his home in Rome, N. Y., on July 6, 1924, at the age of 79 years. He became identified with the Rome Brass & Copper Company, Rome, N. Y., in 1879 as superintendent, and later was appointed superintendent of the metal mills, which position he held up to the time of his death.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

AUGUST 1, 1924.

Industrial conditions are admittedly poor in this city at present, according to the heads of the local brass industries. The consensus of opinion is that the depression is not necessarily due to this being election year and improvement is looked for before election time. As soon as the man in the street starts buying as he normally would, it will gradually lift, and not before.

"Conditions are certainly pretty poor now," said **John H. Goss**, vice-president and general superintendent of the **Scovill Manufacturing Company.** "Most of the business men I have talked with believe conditions will be better in the Fall. There is a let-up in the best years during the Summer months.

"I don't know wether the election has anything to do with it or not. I tihnk not. The question as to when the depression will end, is largely a question as to when the average man starts buying. The man who will feel the pick-up first will be the distributor as he was the first to feel the depression. We are producers and felt the drop off last and will consequently feel the pick-up last. The present situation is such as to give reason for the belief that good conditions will prevail in the Fall, but just when, no one knows."

"I wouldn't hazard a guess as to the reason for the depression being the coming election or not," said **E. H. Yates**, secretary of the **American Brass Company.** "We hope business will pick up before election. We don't expect conditions will grow any worse than at present and believe if there is any change it will be for the better."

On inquiry at the office of the **Chase Companies, Inc.**, the impression seemed to be that business was at the lowest ebb for the year because of the hot weather and general let-up, which is almost universal in all kinds of business at this time.

"While people always expect the Presidential election to interfere with business more or less," reads their statement, "as the hot weather and vacation season passes, they feel that business will gradually revive and before the end of the year we should be back to a healthy normal. The political situation in view of the character of the two principal candidates seems to us to be favorable and the public is not going to feel it must mark time until after election."

The Department of Labor at Washington, says of Waterbury:

"A slight surplus of workers is apparent in Waterbury as a result of the brass, clock and watch factories in that city operating on part time schedules. Practically, all plants in the city are in operation, however."

Benjamin I. Spock, for many years secretary and general counsel of the Chase Companies, has resigned his position and accepted the position as assistant to the president of the New York, New Haven & Harford Railroad Company, and assistant general counsel for the road.

Charles E. Hart, member of the law firm of **Bronson, Lewis & Hart**, and Corporation Counsel for the city, has severed his connection with the law and expects to resign as Corporation Counsel, having accepted the position of general counsel for the Chase Companies, succeeding Mr. Spock. He will assume his new duties this Fall.

Fred A. Jackle, for some years general superintendent of the Chase Companies, has been elected a director of the companies. He has been in the concern's employ since boyhood, working his way up in the casting and rolling departments to the superintendency of various plants and finally to the general superintendency.

Morris H. Bennett, of this city, has received a patent on an electric furnace, which he has assigned to the Scovill Manufacturing Company. **August H. Cosgrove** has received a patent on tack feed control mechanism for tack fastened, button-attaching machines.

BRIDGEPORT, CONN.

AUGUST 1, 1924.

The statement published in these columns in our July issue about the **Bridgeport Brass Company** was unfortunately distorted by a typographical error. The correct statement is that **Robert H. Booth**, who was assistant to the president of the Bridgeport Brass Company, has resigned to become general manager of the **Whitney MacDonald Company**, of Philadelphia. No other changes have been made in the Bridgeport Brass Company.

Averaging more than 77 years in age, 22 of the pensioned employees of the **Yale & Towne Manufacturing Company**, were given a picnic at Laddin Rock farm by the company, July 12th. Some of the men had been in the employ of the company more than 50 years. They were taken to the farm in automobiles and after a good dinner, all joined in playing games and other amusements. The total ages of the 22 men was 1,609 years. **Walter C. Allen**, president of the company, and Vice-president **Joseph A. Horne** spoke briefly.

Walter F. Wyman, financial editor of the International News Service speaking here last month, urged Bridgeport manufacturers to go after the trade of the Orient, declaring that the Far East offers the best opportunities for American foreign trade today, not only because of size and the comparatively high purchasing power, but because there is a growing appreciation there of the high quality of American goods. No man is a foreigner who buys American goods, whether he lives in China or Europe, he said, but the man around the corner to whom one never sells a dollar's worth of goods

is a total stranger in the commercial sense. Bridgeport is especially favored, geographically, for export trade to the Orient, he said, whether shipments are made through Boston or New York. The bulk of foreign sales are made f. o. b. Boston or New York, consequently, there is less of a freight penalty against manufacturers here than in interior points. If shipments are made to the Far East, the lower water rates more than offset the distance in miles from points geographically nearer the point of consumption.

Henry C. Reid & Son, cutlery manufacturers, have made what is called the smallest knife in the world, measuring one-sixteenth of an inch with the blade open. Special tools required for the work were made by **Mr. Reid**. The blade is gold and the handle, pearl. It has a spring for opening and closing and is held together by tiny rivets.

Simon Lake, of this city, inventor of the even-keel type of submarine, has just been granted a patent by the government for a submersible cargo vessel designed to navigate under ice and to be used for breaking paths through the ice fields. The vessel has a superstructure by which it can be navigated and can dive under ice and rise again, breaking open a path for continued surface navigation. It is a Lake type submarine, enlarged for freight-carrying purpose and reinforced to permit of its breaking through the ice.—W. R. B.

TORRINGTON, CONN.

AUGUST 1, 1924.

Miss Marian Seymour Doughty of Torrington and **Arthur Goodwin Camp,** of Hartford, were married at the Summer home of the bride, in Litchfield, on July 21, by the Rev. Arthur B. Patten, of the Center Congregational Church, Torrington. The bride is a daughter of the late Mr. and Mrs. James A. Doughty, of Torrington, and a cousin of Charles F. Brooker, of Ansonia. The bridegroom is associated with the Phoenix Insurance Company, of Hartford.

Business is improving in Torrington's metal industrial plants. More orders are coming in, though for the most part these orders are small. In several of the plants, additional workers are being taken on. The tendency is toward an increase in prices of products.

"Business is picking up and the outlook is fairly good," is the way that one manufacturer outlined the situation in talking with a representative of the THE METAL INDUSTRY recently.—J. H. T.

NEW BRITAIN, CONN.

AUGUST 1, 1924.

New Britain is holding its own fairly well industrially and is better off than many other manufacturing cities in the East. In common with other places, however, the factories here have suffered a slump to some extent, but as yet not seriously and those at the heads of the various plants are optimistic that the next couple of months, probably by late fall, will see a material increase in business.

That there is a slump though, is not disputed, and practically every factory is working with a minimum of operatives and is hiring no new hands. There is hardly a factory that is not running on short time in some of its departments and some of the entire plants are curtailing on working hours. About all of the larger concerns, with the exception of the P. & F. Corbin factory, have closed down for a week to ten days this summer and this itself is a reflection of the slump, as it has not been a practice to do this.

Orders are not coming in to any extent and aside from keeping abreast of current demands and maintaining a fair stock, none of the concerns are hastening production.

A report current this week that several interested banking houses were about to take over the **Traut & Hine Manufacturing Company** were denied positively by Treasurer **Sternberg.** He stated that the concern has been paying its interest on its bonded indebtedness regularly and doubtless will continue to do so and so long as these obligations are met the financial interests have nothing to say. There is, however, considerable dissatisfaction among some of the stockholders concerning the evident decline of the company.—H. R. J.

PROVIDENCE, R. I.

AUGUST 1, 1924.

The State Treasury will receive revenue amounting to $1,865,322.43 from the assessments upon the corporate excess and franchise taxes of the manufacturing and mercantile corporations, and the gross earnings of the public service corporations as levied by the State Board of Tax Commissioners. This amount represents an increase over last year of $128,058.76 and is the largest since the Board was created in 1912.

Edmund C. Mayo, who came to the **Gorham Manufacturing Company** last January as vice-president in charge of production, has been made general manager of the concern, according to a statement made by Alfred K. Potter, vice-president and treasurer of the company. Mr. Mayo's promotion comes in connection with the reorganization plans of the concern, which have been under way for nearly a year.

Mr. Mayo has had nearly twenty years' experience of high executive character in manufacturing industries, coming to Providence six months ago from the American Tube and Stamping Company of Bridgeport, Conn., where he had been president and general manager. He graduated from the University of Maryland in 1904, and previous to going with the Bridgeport concern, was general manager of the Worcester Pressed Steel Company.

Walter C. Sherman, who for the past twenty years has been associated with the **O. M. Draper Company,** of North Attleboro, has left that concern to become manager of the **Harwood Brothers Company,** of Boston. Mr. Sherman was connected with the selling department and before leaving the factory the employes and firm presented him a chair as a mark of the esteem in which they held him.

Atlas Sheet Metal Works, Inc., have been adding to their facilities for handling sheet metal work of every description at 233-237 Dyer street.

The Eagle Cornice Company, 312 Blackstone street, has the contract for all the sheet metal work at the State Hospital, Foxboro, Mass.

Michael Linnehan, for several years superintendent of the foundry at the **Golding Manufacturing Company's** plant at Franklin, and who recently resigned, has accepted the superintendency of a foundry at Newark, N. J.

The partnership of **Arthur A. McRae, Lawrence P. Keller** and **John A. Cunningham,** which was operating under the firm name of **John A. Cunningham Company,** successors of **Cunningham & McCarthy,** at Attleboro, has been dissolved and John A. Cunningham will be the successor. The firm is located in Railroad street and manufactures goods for the 10-cent store trades for cheap jewelry.—W. H. M.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

AUGUST 1, 1924.

Midsummer dullness prevails in industrial circles in Rochester. In some industries activity has not been so limited in five years. Practically every big institution in this city is taking advantage of this period of depression by taking inventories, extending vacations and making alterations in plants.

Inquiry about the industries utilizing non-ferrous metals reveals in situation of extreme quietude. In the grass foundries this is particularly noticeable, and it is feared there will be no improvement before the dawn of October.

Manufacturers can not explain this state of affairs except that the year 1924 has been a backward year in all respects. It is not believed that the presidential event has had anything to do with the general depression, but that production in

many lines has been overdone. The can companies, which use a great deal of tin, are busy, as is usually the case at this time of the year. The **Eastman Kodak** plants are fairly active, but many shifts are said to be working on short time basis.

To date there are no new metal-using enterprises projected, and wholesale dealers in metal supplies say the prospects for fall trade are not encouraging. But for the rather spirited building operations taking place in the downtown business districts the metal industries in Rochester would be quite flat this summer.

It is announced that the **Stromberg-Carlson Telephone Manufacturing Company** will erect a $200,000 building as a new unit to its already extensive plant. The company now employs about $1,000 operatives, and during the year use a great deal of copper, brass, aluminum and bronze in manufacturing telephone equipment.—G. B. E.

TRENTON, N. J.

AUGUST 1, 1924.

Concerns engaged in the manufacture of metal articles in this city report business as having decreased a little during the past month, but are looking for it to pick up shortly. There has been a cut in the price of hardware goods, but this is not expected to last long. Manufacturers believe there will be an increase in raw material by fall. The **Trenton Emblem Company** is working on some good sized orders, while the **Skillman Hardware Company** reports business as being pretty fair. "Presidential Year" has always had a bad effect upon business and always results in money becoming more scarce.

The **John A. Roebling's Sons Company,** the largest concern of its kind in the country, has cut down the working hours and is now operating but five days a week. Following the appointment of receivers, the **J. L. Mott Company** closed down, but this is said to be only temporary. The company has plenty of orders on hand and is looking for a busy season. The Skillman Company has let a contract for a one-story brick addition.

Universal Metal Box and Products Company of Newark, N. J., has been incorporated at Trenton with $100,000 capital to manufacture electrical switch boxes, etc.

T. C. Manufacturing Company, of Belleville, N. J., has been chartered at Trenton with $25,000 capital to manufacture incandescent lamps.

Jasspon Manufacturing Company, Inc., of West New York, N. J., has been chartered at Trenton to manufacture hardware.

Other concerns chartered here were: **Olber Chemical Company,** Newark, N. J., manufacture chemicals, $50,000 capital.

Fire-O-Cide Chemical Corporation, Hoboken, N. J., manufacture chemicals, $125,000 capital.

Allegheny Chemical and Products Company, Camden, N. J., manufacture chemicals, $350,000 capital.

United Radio and Electric Corporation, Newark, N. J., manufacture radio supplies, $100,000 capital.

The **Factory Placement Company,** 390 George street, New Brunswick, N. J., has been incorporated with 5,000 shares of stock with no par value to acquire and dispose of the plant of the **Aluminum Wheel Company of America** at that place. The incorporators are Alexander Merchant, Harry J. Rolfe and Elmer B. Boyd. The organization is composed of stockholders of the wheel company. The latter concern a few years ago built a new plant at New Brunswick and later failed.

The **Livingston Auto Parts,** of 164 Market street, Newark, N. J., has been chartered at Trenton with $10,000 capital to manufacture automobile tires and various kinds of copper, brass and lead articles. The incorporators are Edward Horwitz, William Permison and Solomon M. Halprin, all of Newark.—C. A. L.

PHILADELPHIA, PA.

AUGUST 1, 1924.

Generally considered, the metal trades in the Philadelphia district are in virtually the same position as a month ago, with the exception of slight improvements noted for the last several days. Brass, copper and copper screens and wire are leading all sales. Prices in most instances have been fairly steady, with numerous inquiries from large users. Some inquiries have been received by local merchants from Japan and the Philippine Islands for copper products. Philippine Island sugar plantations owners are reported to be in the market for copper tanks or vats of large dimensions.

Most of the buying of brass pipe for new construction work has virtually disappeared. Few orders still are in the market. Lead continues to be in fair demand. Most of it is being used by storage battery builders, while a considerable quantity is used by builders and wire manufacturers.

There is a better demand for aluminum now than during the last two months. This, however, cannot be construed to be the barometer of return of better business, as most of the buying is forced or rather accelerated through the price rises in various raw material commodities. Virtually the same explanation might cover the zinc market. Sales are increasing with an attendant rise in prices.

Platers report that business for the season has been rather dull and spotty. New orders are slow in being placed, while at the same time, consumers are searching the market for the lowest possible prices. However, there is enough work on hand to keep the plants busy for at least another month. In the meanwhile it is hoped that plating orders for lighting fixtures and automobile accessories will develop. Platers complain there is a growing tendency for builders to use greater amounts of wrought iron fixtures in new home construction. But because of its higher costs when compared with other materials it is not believed they will materially affect the platers industry relating to the fixture trade.—A. F. C.

PITTSBURGH, PA.

AUGUST 1, 1924.

The sentiment with respect to new business in the metal industry in this state is appreciably improved as compared a month ago. The costly plans manufacturers are developing in order to make their plants more efficient, indicates their confidence in the future business outlook. Some Shenango Valley manufacturers look for advances in prices in many commodities.

Manufacturers of wire cloth and other wire products report a fair amount of business. Poor weather delayed business, and orders ordinarily received early in spring are just reaching the mills. Copper screening is the most active item at this time. The call is chiefly, for the fine meshes. This is due to the efforts of manufacturers to show consumers the value of the fine mesh for summer screens. It is contended that coarser meshes do not accomplish the purpose for which screens are intended. Because of its durable qualities, copper is in greater demand than galvanized.

Radio supplies manufacturers are buying sparingly, and indications are that not much business will be done in this line until fall.—H. W. R.

MIDDLE WESTERN STATES

DETROIT, MICH.

AUGUST 1, 1924.

The brass, copper and aluminum business in Detroit has been quiet for many weeks and there is not much prospect of improvement for a considerable time. The prosperity of this business is largely governed here by the automobile industry and that, just at present, is not in the best of shape. Most of the plants are operating on part time and some are doing practically nothing at all. The industry is simply feeling the general effects of the business stagnation that is affecting every other line. Everyone is hoping for an early improve-

ment, but when that will arrive no one seems to be in a position to make anything like a reliable forecast.

The three armed thugs who entered the **City Brass Foundry** at 1979 Macomb street recently, are believed to have sought to obtain the company's payroll. When they discovered they were too late for that they proceeded to levy individual tribute upon the manager and four employes, gathering in, it is stated, $192.40. In the front office they relieved a woman cashier of $30. Another employe gave up $65. Leaving one of their number in charge, the other thugs extended their activities to the rear of the workshop where they compelled three brass polishers to lie face downward on the floor while they rifled their pockets. It is believed the thugs made their escape in an automobile.

The **Edmund & Jones Corporation,** Detroit automobile lamp manufacturers, have well under way the construction of a three-story production unit adjoining its present plant. The building, which is to be completed by September, is of steel and concrete and when the machinery and other equipment has been added will represent an outlay of approximately $400,000. The new plant will be devoted primarily to the production of a "no-glare" lamp, and will increase the capacity of the plant approximately 20 per cent.

The **Great Lakes Distributing Company** of Detroit has purchased foundry bank sand properties located near Saginaw, covering 160 acres adjacent to the Pere Marquette Railroad. Engineers estimate there are in excess of 100,000 car loads of the highest quality bank sand for core making purposes that is known to exist anywhere. Additional equipment is being purchased which will increase the present daily loading capacity to 42 cars. This company, for several years, has jointly operated and had exclusive sale of the bank sand, but now is entering the production field on a larger scale, having in contemplation the purchase of molding sand properties in Ohio.

The **Higgins Brass & Manufacturing Company** has purchased a tract of land of one and one-third acres at the northwest corner of Dequinder and Halleck streets where it will begin at once the erection of a factory building 80 by 200 feet, so arranged that capacity may be doubled at any time. It is stated that this company has recently increased its capital stock and is preparing for extensive operations.—F. J. H.

CHICAGO, ILL.

AUGUST 1, 1924.

Metal prices were strong in the Chicago district during the latter half of the month, tin in particular making a sharp advance of 4 cents in the week ending July 20. While buying was quiet in most lines during the early part of the month, a heavier demand developed by the fifteenth. Prices were easier in old metals, dropping off an eighth to a quarter of a cent early, but regaining this in the latter part of the month. Scrap metal dealers have marked up their white metal grades in keeping with the advances in virgin material.

The **C. G. Spring and Bumper Company** have developed a nickel plating process which is showing remarkable protective ability in resisting rust, according to their announcement following tests. This process is said to be seven or eight times as rapid as ordinary commercial plating, depositing a three-ply coat of nickel, copper and nickel on bumper bars, which shows a rust resistance six times greater than the ordinary process, it is claimed.

A recently tested nickel coating resisted rust for over 400 hours in a salt spray, as against 15 hours averaged for the ordinary plating, the company announced. An hour in the salt spray is approximately equal to a month of exposure to weather conditions.

Owing to the rapidity of the process, it is possible to turn out a large production with a minimum of equipment and floor space. Further experimental work is being expedited along these lines.

The **Murray Engraving Company's** plant at 6152 S. Wabash avenue, Chicago, was destroyed by fire July 7 with a loss of $10,000. The proximity of two 10,000-gallon gasoline tanks in a Yellow Taxicab Company repair shop next door caused Fire Chief James Buckley to summon extra equipment. Three hundred taxicabs undergoing repairs were removed safely.

The **Brennan, Moxley & Mervis Company** plant at 3427 South Kedzie avenue was robbed of sixteen bars of copper, each weighing 250 pounds, by three armed men on July 6. S. Workman, a watchman, was knocked unconscious, but was not seriously hurt. The bandits removed their loot in a truck.

John E. Kavanagh, president of the **Chicago Ferrule Company,** who died May 26, left an estate valued at $250,000, according to a petition for probating the will, filed in the Probate court by the State Bank of Chicago and Clarence H. Kavanagh, of Wilmette, Ill. The estate consisted of real estate and personal property.

The Secretary of State of Illinois recently has issued articles of incorporation for the following new concerns:

Clayton Mark & Company, 111 W. Washington street. Capital $1,500,000. To manufacture, buy, sell, import export and deal in iron, steel, copper, zinc and other metals. Incorporators: Clayton Mark, Anson Mark and Leland K. Neeves. Correspondent: L. K. Neeves, 134 S. LaSalle street.

Newman Tool & Machine Company, 542 West Jackson Boulevard. Capital $20,000. To manufacture and deal in machinery, tools, dies. Incorporators: H. E. Board, C. B. Gilmore, A. E. Kallen. Correspondent, H. E. Board, P. O. Box 42, Evanston, Ill.

General Fireproofing Company, of Illinois, 2921 S. LaSalle street. Capital $20,000. Deal in and manufacture mineral substances, metals and mineral products. Incorporators: R. S. Pruitt, P. Lee and A. Tobin. Correspondent: Miller Goreham Wales & Noxon, 1017 New York Life building, Chicago.

Schero Brothers Company, 410 North Western avenue. Capital $50,000. Deal in waste materials and brokerage in same. Incorporators: Matthew Schero, Harry Schero, William Schero. Correspondent: Hoffman and Buckhaller, 140 North Dearborn street.

The following changes in articles of incorporation have been authorized by the Secretary of State of Illinois:

Peerless Engraving and Colortype Company increase in capital stock from $9,000 to $75,000.

Chicago Metal Manufacturing Company decreased capital stock from $200,000,000 to $51,800.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

JULY 17, 1924.

Working conditions in some respects have improved for the metal trades. Scarcity of fuel no longer prevails. Export demands for coal and coke have fallen off considerably and prices to the home consumer have undergone a considerable drop. In new metals the market has been fluctuating, but in the main has had a downward tendency. On the other hand, good brass scrap, now, that surplus war stores are exhausted, is difficult to obtain. Zinc has become easier during the last fortnight. Manufacturing business is best in the rolling mills. Extruded bars are in good request, largely on account of the requirements for wireless receiving apparatus, makers of which continue very busy. Brass founders have experienced a set-back in some departments of their home trade, owing to the strike in the building trades. The furniture trade, which had seen some revival, has also been affected to the disadvantage of makers of cabinet brass foundry. Export business in the brass trade is fairly well maintained. Jewelers, except for seaside demands, which advantage chiefly the makers of cheap and imitation jewelry, are no better employed than they were a month ago. Silversmiths are doing a little better, but the electroplaters are still very short of orders. A brisker demand for aluminum scrap is due partly to motor trade requirements. For fruit preserving vessels, the metal has a growing preference. It has a new rival in stainless steel which one or two firms in the Midlands are adopting for cooking vessels. In the tube and wire mills, business has been quiet, but a little improvement is noted.

Business Items—Verified

The **Chase Companies, Inc.,** Waterbury, Conn., announce the election of **Frederick A. Jackle,** works manager, to the directorate of the company.

The **Armstrong Cork & Insulation Company** announces the removal of its Omaha, Neb., branch to new enlarged offices at 532 Peters Trust Building, Omaha, Neb.

The **Torrington Company** will move the factory equipment of its subsidiary, the Excelsior Needle Company, at Chicopee, Mass., to the company's main works in Torrington, Conn.

Mackintosh, Hephill & Company, Twelfth street, Pittsburgh, Pa., announce that there is no truth in the report that they are in the market for grinding machinery and electrical tools for a foundry.

Plume & Atwood Manufacturing Company, Waterbury, Conn., manufacturer of brass goods and fixtures, is taking bids on revised plans for a five-story addition, totaling 30,000 sq. ft. This company operates a cutting-up shop.

Rumors published in other journals to the effect that the **Lux Clock Manufacturing Company,** Sperry street, Waterbury, Conn., is planning for a one-story addition, 25 x 103 ft., are very premature. There are no present intentions of building.

Oxford Manufacturing Company, Oxford, N. C., has started work on a one-story plant for the manufacture of automobile license plates and other stamped metal products. This company operates the following departments: cutting-up shop, stamping, lacquering.

Bergen Point Brass Foundry, 161 Hobart avenue, Bayonne, N. J., has built a new plant and expects to have same in operation by September 15th. The company handles jobbing work, but specializes more or less in chandelier castings. This plant will triple production.

Hammond Brass Foundry, Hammond, Ind., has acquired four acres in that city as a site for a new plant. This company operates the following departments: brass, bronze, and aluminum foundry; brass machine shop, tool room, grinding room, plating, polishing.

Unique Brass Foundry, 123 Military street, Detroit, Mich., has awarded contracts for constructing 1-story, 50 x 50-foot drop forge building. The company operates the following departments: brass, bronze foundry; brass machine shop, tool room, grinding room.

The **Metal Products Company, Inc.,** has been incorporated at West Haven, Conn., capitalized at $100,000, to make and deal in machinery. This company operates the following departments: tool room, grinding room, japanning, stamping, soldering, polishing, lacquering.

Peck, Stow and Wilcox Company, Southington, Conn., has let contract for a new forge shop, a three-story building at its Cleveland, Ohio, plant. The company has also let contract for a new grinding room at its main plant located at Southington. This firm manufactures hardware and tools.

Bronze Piston Ring Company, Indianapolis, Ind., recently organized with capital stock of $75,000, will manufacture bronze piston rings. Property has been leased at 910 N. Illinois street. This company operates the following departments: rolling mill, tool room, stamping.

Milwaukee Die & Tool Company, 136 Reed street, Milwaukee, Wis., has changed its name to Advance Tool & Die Casting Company, following the recent establishment of a die casting department. This firm operates the following departments: aluminum foundry, tool room, stamping.

The **Galt Machine & Screw Company,** Galt, Ont., Canada, has purchased the assets and patent rights of the Touring Car Equipment Company, and will manufacture "Ever Ready" tops of the Canadian trade. This company operates the following departments: japanning, windshield tubing.

The **Shiman-Miller Manufacturing Company,** 45 Austin street, Newark, N. J., manufacturer of gold jewelry products, has awarded a general contract to the Becker Construction Company, 361 Grove street, for a three-story addition, 95 x 95 ft., estimated to cost $75,000 with precision and other machinery.

The new building of the **Crown Rheostat & Supply Company,** at 1910 Park avenue, Chicago, Ill., is a two-story and basement structure, and built on half of a hundred-foot lot,

the balance of lot being reserved for future growth. This building is enabling the company to go into the manufacture of some items that it previously jobbed, notably the new lathe.

J. F. Buhr has opened an office in the Blodgett Engineering and Tool Company Bldg., at 14th and Dalzelle streets, Detroit, Mich. The J. F. Buhr Machine Tool Company will act as sales representative for the Blodgett Engineering and Tool products. The outstanding item of these is the Buhr Ball Bearing Fully Adjustable Multiple Driller. The Blodgett Engineering & Tool Company also specializes in fine tool and die work.

The **Simplex Engineering Company,** West Bancroft & Sylvan avenue, Toledo, Ohio, has changed its corporate name to the Simplex Aluminum and Bronze Castings Company, in keeping with its enlarged policy and to more accurately describe the character of its business. The company is located at the above address. This firm operates the following departments: brass, bronze and aluminum foundries; brass machine shop, polishing.

The **C. & G. Foundry & Pattern Works,** Indianapolis, Ind., will not buy additional equipment at present in connection with the consolidation of its pattern shop and foundry departments. At a future date they will be in the market for equipment to increase foundry production and to handle all classes of brass, bronze and aluminum castings. Extensions are planned for the near future. Charles J. Gisler is president and Fred W. Crider, secretary and treasurer.

Cooke & Company, 152 West 42nd street, New York City, are issuing 75,000 shares, 8% cumulative preferred stock of the **Silvel Metal Manufacturing Company, Inc.,** New York. Preferred stock, 8% cumulative par value $10.00—$1,500,000; outstanding 24,630 shares; common stock, no par value, 300,000 shares; outstanding 6,789 shares. Officers of the company are as follows: M. L. Jacobs, president; C. L. Boone, vice-president; C. H. Cooke, treasurer; I. S. Runyon, secretary.

The **Pines Manufacturing Company,** 404-412 N. Sacramento boulevard, Chicago, Ill., manufacturers of Pine automatic Winterfront, which is a radiator shutter for automobiles, thermostatically controlled, is adding to its plan, a two-story addition, 125' x 133', estimated to cost $82,000, with additions for sprinkling system, etc., which will bring the cost of the addition to cover $100,000. This company operates the follow-

ing departments: tool room, grinding room, japanning, stamping.

The **Morse Engineering Company,** St. Louis, Mo., have just been appointed exclusive territory selling agents for the **Ramsey Chain Company,** general offices and works Albany, N. Y. The Ramsey chain is a silent transmission chain of novel construction. A very interesting treatise on the subject entitled "Power Transmission with Ramsey Silent Chain," is issued by the Ramsey Chain Company and a copy will be sent free to anyone requesting same on his firm's stationery and mentioning the name of this publication.

Insurance protection for its employes has been arranged by **Gehert Brothers,** a foundry concern, of Bridgeport, Pa., through the medium of a group life, accident and health insurance policy in the Metropolitan Life Insurance Company. The total life insurance protection amounts to $64,000. Each worker's life is insured for $1,000 while, if sick or injured, he will receive a payment of $10 a week, for a maximum of twenty-six weeks. In addition he is entitled to the services of a Metropolitan nurse and to the health pamphlets distributed by the insurance company.

The name and address of the **Maumee Metal Parts Company,** Toledo, Ohio, has been changed to the **Toledo Alloyed Castings Company,** with offices at Hamilton and Division streets. In addition to its permanent mold plant, the company has completed plans for the installation of new equipment and the construction of new buildings on property adjacent to the present plant in which will be housed an experimental and sand casting foundry. This company operates the following departments: smelting and refining; brass, bronze and aluminum foundries; tool room, grinding room, casting shop, cutting-up shop.

BUSINESS TROUBLES

Frank A. Scott, receiver the Standard Parts Company, Cleveland, Ohio, has issued a report, part of which is as follows: during the period of the receivership, from September 1, 1920, to June 18, 1924, the receiver made an actual money profit of $779,893.50. This amount was realized from the operation of the several plants and after all expenses of every character entailing an outlay of cash were charged against him. During this period he completed all outstanding sales contracts, and liquidated a very large inventory that was turned over to him at the time of taking charge.

However, during the same period, he was charged with depreciation of properties, $1,123,013.09, and inventory adjustments of $321,322.37, which were arbitrary charges and meant no outlay of money. Other charges which required a payment in cash were idle plant expense, $62,820.18, and the settlement of a long pending patent suit $2,500.00, both of which would have obtained in any event, the net result of all of which being, as shown in the June statement a deficit of $729,862.14.

BRIDGEPORT BRASS WIRE CONTRACT

About two years ago it was decided to electrify the Virginian Railroad between Roanoke and Mullens. Specifications, including all possible types of wires, were drawn up. As details were thrashed out, Gibbs and Hill, Consulting Engineers and Erectors, finally decided upon final specifications. A 19 strand composite cable was decided upon in order to provide a combination of conductivity and tensile strength. After carefully considering the types of wires and materials available, as well as the prices, the products of the Bridgeport Brass Company were chosen. Quality and reliability were the chief factors which resulted in the sale of Phono-Electric and Phono-Hi-Strength. The total poundage is 1,260,000. lbs. The contact wire is of Phono-Hi-Strength and the whole installation is remarkable in that it is the first all non-ferrous job of its kind in the country.

NEW JERSEY ZINC COMPANY EXPANDS

It has been learned that the New Jersey Zinc Company is building a rolling mill at Palmerton, Pa., for the rolling of zinc sheets. The decision has been the result of a long and deliberate consideration and a thorough analysis of the field. Many requests have come from the trade for such a service, and it is believed that the entry into the field of a company such as The New Jersey Zinc Company, will be well received by the industry.

For a number of years this company has been supplying the trade with strips, rolled from zinc slabs. A large percentage of this production has been utilized by fabricators of spouting and gutters and in standing seam roofing. It is expected that The New Jersey Zinc Company, within a short time, will be a large producer of corrugated and plain zinc sheets, and will supply the trade with standard sizes and gauges in addition to the narrower strips and ribbons now made by this company.

It will be of interest to the trade to know that this new plant will be centrally located, and served by trunk line connections, so it will be in a position to make shipment to any point. The executive offices of The New Jersey Zinc Company are located at 160 Front street, New York, N. Y.

NEW STANDARD SAMPLES

A new standard sample of high carbon ferrochrome which will be known as No. 64 and a renewal of No. 80 of Bessemer 0.1 per cent carbon steel are now ready for distribution with provisional certificates. Sample No. 64 contains chromium 67.95, iron 24.08, carbon 5.10, manganese 0.23, phosphorus 0.016, sulphur 0.07, silicon 2.05, and small amounts of copper, nickel, vanadium, titanium and aluminum. Sample No. 80 contains carbon 0.084, manganese 0.433, phosphorus 0.105, sulphur 0.092, silicon 0.025, and small amounts of copper, nickel, chromium, vanadium, molybdenum and arsenic. The price of sample No. 64 is $3.00 per 100 grams and of No. 80 $2.00 per 150 grams, prepaid or Parcels Post, C. O. D.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America.....	$100	$500	$525
American Hardware Corporation....	100	73½	75
Anaconda Copper	50	36⅛	36¼
Bristol Brass	25	..	9
International Nickel, com.....	25	17¾	18
International Nickel, pfd.....	100	85½	88
International Silver, com.....	100	115	..
International Silver, pfd.....	100	103	107
National Enameling & Stamping....	100	24	24½
National Lead Company, com.....	100	145	146½
National Lead Company, pfd.....	100	114½	..
New Jersey Zinc.....	100	141	143
Rome Brass & Copper.....	100	120	135
Scoville Manufacturing Company....	..	243	248
Yale & Towne Mfg. Company, new..	..	64	66

Corrected by J. K. Rice, Jr., Co., 36 Wall street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

Toward the end of July there was a noticeable improvement in the copper situation and two advances in the prices of brass and copper rods, sheet, wire and tube were made effective. This improvement in the metal market was a great relief to all of the factors in the trade after so many months of falling prices, and decreasing business. The advance in price had the effect, which is usual under such conditions, of uncovering a large amount of tonnage, with the result that the

mills booked contracts and orders in rather heavy volume.

The conditions throughout the trade have been materially improved in the past few weeks, and many of the factors in the industry feel that the sun will shortly begin to shine for the entire trade. During this long period of depression, practically all of the stocks which were held by both manufacturers and jobbers had been consumed, and there is very little material held, so that the view which has heretofore been expressed to the effect that any turn in business would uncover a number of orders appears about to be realized. The general business situation is reported to be improving at a very rapid rate and this is naturally reflected in the brass and copper industry as well as other lines of effort.

Unfortunately, there is still a tendency on the part of some of the fabricators to cut prices, and the margin of spread between the prices of raw metal and the price of fabricated products is still very slim. It is expected, however, that as the mills fill up their order books this tendency will be modified to a degree that will shortly establish the prices of fabricated material on a basis that will mean a profit to the manufacturers, and a more satisfactory condition throughout the entire industry.

There have been some huge contracts placed for electrical equipment, notably one large contract for the electrification of several hundred miles of railroad lines, and one or two large water-power developments and these items have helped materially in the general situation.

There is also a distinct improvement in business in the other non-ferrous lines having to do with the nickel alloys, such as nickel-silver, pure nickel, Monel metal and similar items, and the mills manufacturing these products report a marked increase in their orders. The improvement in the textile business has encouraged some of the textile manufacturers to increase their capacity and make new installations of machinery to such a degree that specifications for these installations including Monel metal have run into very satisfactory volumes as to tonnage.

A heavy consumption of nickel is also reported in the hotel and restaurant field, as previously noted in these columns, and the campaign of education on the part of the manufacturers showing the value of nickel in this line of industry is taking effect upon this from the total consumption of nickel.

Taking conditions as a whole, it is safe to say that there is a spirit of optimism and expectation for better times now prevailing through the trade to a degree which has not been noticeable for many months past.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

The copper market has become definitely stronger recently with prices higher than they have been in over two months. During the first half of July the market was conspicuously slow and depressed. Consumers were inclined to pursue a hand-to-mouth buying program. Sales were in limited volume, and prices dropped to the low level of 12¼ to 12⅜ cents.

A more stable situation developed about the middle of July, and evidences began to appear that the market had hit bottom. The statistics for June showed a production of 205,000,000 pounds, as compared with 226,000,000 pounds in May.

Shortly after these figures appeared the market reflected improvement based upon the more favorable statistics. As we go to press the market is steady at 13¼ @ 13⅜ cents for shipments over the next three months. The rate of domestic consumption fell off lately to summer schedule dimensions. Increased demand is confidently expected when fall activity sets in at wire and sheet mills.

ZINC

Demand for zinc improved last month, and a large tonnage was sold recently for domestic consumption and on export orders. The tone of the market is consequently firmer than a few weeks ago, with East St. Louis delivery 6.05-6.10 and the New York price 6.40-6.45 for nearby shipments. Export business was a recent feature, and the foreign buying was a distinct factor in the upward price movement. The outlet for export imparted considerable strength to the market at a time when the domestic situation lacked the favorable elements of firmness. Trading was less active as July closed and prices were inclined to ease off. The East St. Louis price was 5.95-6.00 cents and sellers ready to consider bids. Stocks at smelting plants May 31 were 42,364 tons, against 32,778 tons on April 30th, an increase of 9,586 tons.

TIN

A much better tone developed on the tin market throughout July. The New York price of Straits tin for August-September delivery was quoted on July 30th at 48⅞ @ 49⅛, which compared with 44¾ @ 44⅞ cents on July 1st. Active speculative buying by London operators gave the market strong support and started prices on the upward trend.

American consumers, however, confined purchases to limited quantities, but the aggressive London traders are banking on large American requirements during the next three months. They have succeeded in pushing the price of Straits tin up £17 15s 0d per ton since July 1st, and the aim is to force domestic consumers to cover their fall requirements at high levels. Some local dealers are being impressed with the upward trend of the market and have become more optimistic on the outlook. If consumers decide to take a similar view of the situation a lively and strong market is anticipated. But if the consuming trade have enough reserve stocks to fall back upon it may mean a reversal of market tendencies before long.

LEAD

The lead situation has demonstrated a condition of inherent soundness which has resulted in market firmness and higher prices. The leading producer made two advances in price each of $5.00 per ton during July. The New York price quoted by the American Smelting & Refining Co. is now 7½ cents, against 7 cents on July 1st. Buyers are paying the advance without any sign of complaint, and independent sellers quote 7.65 @ 7.85c as New York basis. Consumers are anticipating future requirements and are anxious to cover probable needs for next few months at present prices. Indications are for a dependable market, with an upward price movement should consumption hold up at current rate.

ALUMINUM

The aluminum situation gives indications of resting on a sound foundation. The market is firm at 28 cents for 99 per cent plus and 27 cents for 98-99 per cent. Inquiries have increased lately and sellers of imported material are cautious about offering. There is a steady outlet in Europe for foreign metal and consumption abroad is on a large scale. New buying by automobile markets is looked forward to for Fall production. Domestic consumption is therefore likely to absorb heavy quantities.

ANTIMONY

There is more inquiry for antimony by both dealers and consumers, but no pronounced active movement has resulted thus far. Offerings from China lately reflect bullish attitude of producers, and are too high to interest substantial orders from this country. Chinese regulars 99 per cent pure quotes 6⅞ cents c. i. f. New York and 9 cents in carload lots, duty paid. Buying interest is shown to a moderate extent, but actual business in the article is limited.

QUICKSILVER

The market for quicksilver remained dull and easy during recent weeks. There are signs of more life stirring, however, and prices appear inclined to rebound from the recent low level of $70.50. Price quoted at present is $72.00 per flask, but any

brisk demand is likely to send the market higher. Importations are limited and consumers are expected to increase their orders to cover requirements over balance of year. A firmer market is consequently expected.

PLATINUM

Demand for all grades of platinum were slow recently and buyers conservative. The market has become firmer in tone lately, however, and sellers of refined platinum quote $120 an ounce for usual lots. Purchases for holiday and other requirements are expected to stimulate demand in coming weeks.

SILVER

The price trend of silver is toward higher levels. Recent strong buying lifted the domestic price to 68¼ cents an ounce, a new high price for this year. American exports of silver for several months are in excess of production, and if present demand is maintained, there may be an actual shortage of the white metal in this country. Buying has been very active for Far Eastern points, particularly for China and India. Domestic monthly production approximates 5,000,000 ounces. Our exports for first half of this year amounted to $51,577,340, against $24,260,543 last year.

OLD METALS

Trade and sentiment have become distinctly better in the scrap metal markets owing to the improvement noted in primary markets. Lead, copper and brass are now wanted by eager buyers, and advancing prices have only made dealers and consumers more keen to purchase. Demand is specially good for copper scrap in all forms. Lead is also in liberal request. Dealers, however, are loath to part with material which is showing such definite upward tendency. It looks like lively markets for all the popular scraps for sometime to come. Dealers are in market to buy heavy copper at 10½-10¾c, crucible copper at 11-11¼c, heavy brass at 6-6½c, heavy lead at 6½-6½c, new brass clippings at 8-8¼c, and new zinc scrap at 4¼-4½c.

WATERBURY AVERAGES

Lake Copper—Average for 1923, 14.979—January, 1924, 13.00—February, 13.125—March, 13.875—April, 13.625—May, 13.25—June, 12.75—July, 12.75.

Brass Mill Zinc—Average for 1923, 7.479—January, 1924, 7.25—February, 7.50—March, 7.25—April, 7.00—May, 6.00—June, 6.60—July, 6.70.

Daily Metal Prices for the Month of July, 1924

Records of Daily, Highest Lowest and Average

	1	2	3	4*	7	8	9	10	11	14	15	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free													
Lake (Delivered)	12.624	12.625	12.625	....	12.625	12.625	12.50	12.625	12.625	12.625	12.625	12.625	12.625
Electrolytic	12.50	12.45	12.40	....	12.35	12.35	12.25	12.30	12.35	12.45	12.45	12.50	12.45
Casting	12.25	12.25	12.20	....	12.15	12.15	12.00	12.125	12.125	12.25	12.25	12.25	12.25
Zinc (f. o. b. St L.) c/lb. Duty 1¼c/lb.													
Prime Western	5.80	5.80	5.80	....	5.80	5.80	5.80	5.85	5.85	5.85	5.85	5.85	5.85
Brass Special	5.90	5.90	5.90	....	5.90	5.85	5.85	5.95	5.95	5.90	5.90	5.90	5.90
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	44.75	44.50	44.00	....	44.125	43.875	43.25	43.25	44.00	45.00	45.125	46.375	45.875
Pig 99%	44.25	44.00	43.50	....	43.625	43.625	43.00	43.00	43.50	44.50	44.625	45.875	45.375
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.70	6.70	6.70	....	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.75
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	....	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.	28	28	28	....	28	28	28	28	28	28	28	28	28
Outside Spot	27	27	27	....	27	27	27	27	27	27	27	27	27
Electrolytic (Internat. Nick. Co.)													
Ni.—99.80 contam. impur.—.14	30	30	30	....	30	30	30	30	30	30	30	30	30
Brit.-Amer. Nick. Corp.													
Ni.—98.50 contam. impur.—.80	28	28	28	....	28	28	28	28	28	28	28	28	28
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.40	8.35	8.35	....	8.35	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.375
Silver c/oz. Troy Duty Free	65.75	66.125	66.25	....	66.375	66.50	66.625	66.875	67.00	67.50	67.25	67.24	67.125
Platinum $/oz. Troy Duty Free	116	116	116	....	116	116	116	115	115	118	118	118	118

	18	21	22	23	24	25	28	29	30	31	High	Low	Aver.
Copper (f. o. b Ref.) c/lb. Duty Free													
Lake (Delivered)	12.625	12.875	13.00	13.00	13.125	13.125	13.25	13.375	13.375	13.25	13.375	12.50	12.835
Electrolytic	12.45	12.64	12.75	12.00	12.90	12.95	13.15	13.125	13.05	13.00	13.15	12.25	12.619
Casting	12.25	12.50	12.50	12.625	12.75	12.875	13.00	13.00	12.875	12.875	13.00	12.00	12.432
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	5.85	5.90	5.95	6.05	6.10	6.10	6.10	6.10	6.00	6.00	6.10	5.80	5.911
Brass Special	5.90	5.95	6.00	6.10	6.15	6.15	6.15	6.15	6.05	6.05	6.15	5.85	5.975
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	46.375	47.875	48.625	48.125	47.75	48.75	48.25	48.25	49.125	49.25	49.25	43.25	46.068
Pig 99%	45.875	47.375	48.125	47.625	48.25	48.25	47.75	47.75	48.75	48.875	48.875	43.00	45.795
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.75	6.75	6.90	7.00	7.25	7.375	7.45	7.45	7.60	7.50	7.60	6.70	6.935
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.	28	28	28	28	28	28	28	28	28	28	28	28	28
Outside Spot	27	27	27	27	27	27	27	27	27	27	27	27	27
Electrolytic (Internat. Nick. Co.)													
Ni.—99.80 contam. impur.—.14	30	30	30	30	30	30	30	30	30	30	30	30	30
Brit.-Amer. Nick. Corp.													
Ni.—98.50 contam. impur.—.80	28	28	28	28	28	28	28	28	28	28	28	28	28
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.375	8.375	8.50	8.50	8.625	8.75	8.875	9.00	9.00	9.00	9.00	8.25	8.481
Silver c/oz. Troy Duty Free	67.00	67.25	67.375	67.50	67.75	68.00	68.50	68.25	68.00	67.75	68.50	65.75	67.182
Platinum $/oz. Troy Duty Free	118	118	120	120	120	120	120	120	120	120	120	115	117.909

*Holiday.

Metal Prices for August 4, 1924

Copper: Lake, 13.125. Electrolytic, 13.00. Casting, 12.70.
Zinc: Prime Western, 6.05. Brass Special, 6.10.
Tin: Straits, 50.125. Pig, 99%, 49.625.
Lead: 7.40. **Aluminum,** 28.00. **Antimony,** 9.00.
Nickel: Ingot, Internat. Nickel Co., 28. Outside spot, 27. Electrolytic, Internat. Nick. Co., 30. Brit. Am. Nick. Corp., 28.
Quicksilver, flask, 75 lbs., $72.50. **Silver,** oz. Troy, 68.50.
Platinum, oz. Troy, $120. **Gold,** oz. Troy, $20.67.

Metal Prices, August 4, 1924

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9½to10½
Brass Ingots, Red	11 to12½
Bronze Ingot	12 to13
Bismuth	$2.40to$2.50
Cadmium	60 to65
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.75
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	11 to16
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Parsons Manganese Bronze Ingots	18¾to19¾
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17½to20½
Phosphor Tin, guaranteed 5%	60 to65
Phosphor Tin, no guarantee	55 to60
Silicon Copper, 10%...according to quantity	28 to35

OLD METALS

Buying Prices		Selling prices
11 to11¼	Heavy Cut Copper	12½to12¾
10½to10¾	Copper Wire	11¼to11½
9 to 9¼	Light Copper	9¾to10
8¼to 8¾	Heavy Machine Comp	10 to10½
6½to 6¾	Heavy Brass	8¼to 8¾
5½to 5¾	Light Brass	6¾to 7
6¾to 7	No. 1 Yellow Brass Turnings	7¾to 8¼
8 to 8½	No. 1 Comp. Turnings	9¼to 9¾
6¼to 6½	Heavy Lead	6¼
4	Zinc Scrap	4½
8	Scrap Aluminum Turnings	10
15½to16	Scrap Aluminum, cast alloyed	16½
18	Scrap Aluminum, sheet (new)	20
25	No. 1 Pewter	27
12	Old Nickel anodes	14
18	Old Nickel	20

BRASS MATERIAL—MILL SHIPMENTS

In effect July 28, 1924.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.16¾	$0.18½	$0.20¾
Wire	.17¼	.19	.21⅛
Rod	.14½	.19¼	.21⅜
Brazed tubing	.24¾	.....	.30⅛
Open seam tubing	.24¾	.....	.30⅛
Angles and channels	.27¾	.....	.33⅜

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.17¾	$0.19½	$0.21⅝
Wire	.18¼	.20	.22⅛
Rod	.15½	.20¼	.22⅜
Brazed tubing	.25¾	.....	.31⅛
Open seam tubing	.25¾	.....	.31⅛
Angles and channels	.28¾	.....	34⅜

SEAMLESS TUBING

Brass, 21c to 22c net base.
Copper, 22¼c to 23¼c net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	18¾c. net base
Muntz or Yellow Metal Sheathing (14" x 48")	16¾c. net base
Muntz or Yellow Rectangular Sheets other Sheathing	17¾c. net base
Muntz or Yellow Metal Rod	14¾c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	19⅛c. to 21⅝c. net base
From stock	20⅛c. to 22⅛c. net base

BARE COPPER WIRE—CARLOAD LOTS

15½c. to 15¾c. net base.

SOLDERING COPPERS

300 lbs and over in one order	19⅛c. net base
100 lbs. to 200 lbs. in one order	19⅝c. net base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9½c basis less 8 per cent discount.

Casks, jobbers' prices	10¾c net base
Open casks, jobbers' prices	11¼c to 11½c net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	40c.
Aluminum coils, 24 ga., base price	36.70c.
Foreign	40c.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	24c.
15%	"	25¼c.
18%	"	26¼c.

Nickel Silver Wire and Rod

10%	"	27¼c.
15%	"	30½c.
18%	"	33½c.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 71¼c. to 73¼c. per Troy ounce, depending upon quantity.

Rolled sterling silver 68½c. to 70½c.

NICKEL ANODES

85 to 87% purity	37½c.-39½c.	per lb.
90 to 92% purity	40c.-42c.	per lb.
95 to 97% purity	42c.-44c.	per lb.

Supply Prices, August 4, 1924

CHEMICALS

These are manufacturers' quality prices and based on delivery from New York City.

Acetone	lb.	.15–.16½
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.30–.35
Denatured in bbls	gal.	.50–.55
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech, Barrels	lb.	.03¼
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.17
Cyanide	lb.	.48
Sulphate, Barrels	lb.	.05¼
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate, see Copperas, bbl	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22¼
Salts, single bbls	lb.	.10½
Salts, double, bbl	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.08¼
Potassium Bichromate, casks	lb.	.09¾
Carbonate, 80-85%, casks	lb.	.05¾
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls	lb.	.03
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.47½
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Cyanide, 96 to 98%, 100 lbs	lb.	.22
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.04¾
Phosphate, tech., bbls	lb.	.03½
Silicate (Water Glass) bbls	lb	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone) bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.33½
Tripoli, Powdered	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.39
Sulphate, bbls.	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base, 40.85
14 inch, 20 ply, 64/68, cloth	base, 50.80
12 inch, 20 ply, 84/92, cloth	base, 46.20
14 inch, 20 ply, 84/92, cloth	base, 62.25
12 inch, 20 ply, 88/96, cloth	base, 63.25
14 inch, 20 ply, 88/96, cloth	base, 85.15
Sewed Buffs, per lb., bleached and unbleached	base, .65 to .75

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.75	2.50
" 6" 8" and over 16"	1" to 3"	2.85	2.60
" 6" to 24"	Over 3"	3.15	2.80
" 6" to 24"	½" to 1"	3.75	3.50
" 4" to 6"	¼" to 3"	4.75	Any quantity
" Under 4"	¼" to 3"	5.35	Any quantity

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.